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CATECHISM OF THE LOCOMOTIVE.

By M. N. Forney, *Mechanical Engineer.*

PART XV.

SCREW-THREADS, BOLTS AND NUTS.

QUESTION 327. *How must the screws of bolts and nuts be made in order that they will fit each other?*

Answer. They must be made of the same diameter, and the threads of the same form and proportions and *pitch.*

QUESTION 328. *What is meant by the "pitch" of a thread?*

Answer. It is the distance the thread progresses lengthwise of the screw in one revolution. Thus if a single threaded screw has one-eighth of an inch pitch, it means that the threads are ⅛ of an inch apart measured from the center of one thread to the center of that next to it, and therefore there are eight threads to each inch in length of the screw.

QUESTION 329. *What is meant by a "single-threaded" screw?*

Answer. It means a screw with but one thread instead of two or more. Thus if we take a string and wind it around a pencil, it will represent a single-threaded screw, and if we take two or three strings and wind them parallel to each other, it will represent a double or treble-threaded screw. Such screws are seldom or never used on locomotives, so that in the following discussion only single-threaded screws will be referred to.

QUESTION 330. *What is the usual form of the threads of screws?*

Answer. The most common is what is called the V thread, represented in fig. 200, which is made sharp at both the top and bottom. If such a thread for one screw is made very pointed and that for another is blunt, it is plain that the nut for the one will not fit the other accurately, and also that if a nut has eight threads to the inch, it will not fit on a bolt with nine. Owing to the fact that, until within a few years, no common standard has been agreed upon for the form, proportions or pitch of screws, there has been very great diversity in these respects in the screws which have been used in the construction of locomotives and other machinery. In 1864 the inconvenience and confusion from this cause became so great that it attracted the attention of the Franklin Institute of Philadelphia, and a committee was appointed by that association to investigate and report on the subject. That committee recommended the adoption of the Sellers system of screw-threads and bolts, which was devised by Mr. William Sellers, of Philadelphia. This same system was subsequently adopted as the standard by both the Army and Navy Departments of the United States, and then by the Master Mechanics' and Master Car Builders' associations, so that it may now be regarded, and in fact is called the United States standard, but the design is due to Mr. Sellers.

QUESTION 331. *What is the form of the thread of this standard?*

Answer. The form is shown in fig. 201, and is similar to the V thread, excepting that it is flattened at the top and bottom.

QUESTION 332. *What are the reasons for the adoption of this form of thread?*

Answer. It has already been pointed out that if a screw is made with a "blunt" thread it will not fit a nut with very acute or "sharp" threads; or, if the thread of the bolt was acute and that in the nut obtuse, they would fit imperfectly. The first thing, therefore, in a standard system is to fix upon the angle which the sides of the thread shall bear to each other. This in the United States standard system was determined by Mr. Sellers at 60 degrees, because that angle is easily laid off without special instruments* and is perhaps as good as or better than any other form for the threads.

It is obvious that if a tool is ground with its sides at an angle of 60 degrees to each other, if the point is made sharp after a very little use it will be worn more or less, so that the bottom of the thread will not be cut perfectly sharp, and therefore it will be difficult to make bolts and nuts with sharp threads fit each other accurately. It is also plain that the sharp edge of a thread gives very little strength to the screw, and yet diminishes that of the bolt very materially. It will also be impossible to measure the diameter of the screw at the bottom of the thread if it is made sharp, as its depth will vary as the point of the tool wears, and it is almost impossible to measure the diameter of such a screw accurately with ordinary callipers. A sharp-edged thread in a bolt is also very liable to be injured and bruised by coming in contact with other objects. To obviate this latter evil the standard threads are made flat on the top, and it is evident that a similar shape at the bottom will give increased strength to the bolt, as well as conform to and fit the thread in the nut. To give this form requires only that the point of the cutting tool shall be taken off, and then it is evident this form of thread can be cut in a lathe with the same tool and in the same manner as the sharp thread. The width of the flat top and bottom should of course bear a definite proportion to the size or pitch of the thread.

QUESTION 333. *What are the proportions of the standard threads?*

Answer. The rule given by Mr. Sellers for proportioning this thread is as follows: "DIVIDE THE PITCH, OR, WHAT IS THE SAME THING, THE SIDE OF THE THREAD, INTO EIGHT EQUAL PARTS, TAKE OFF ONE PART FROM THE TOP AND FILL IN ONE PART IN THE BOTTOM OF THE THREAD, THEN THE FLAT TOP AND BOTTOM WILL EQUAL ONE-EIGHTH OF THE PITCH, THE WEARING SURFACE WILL BE THREE-QUARTERS OF THE PITCH AND THE DIAMETER OF SCREW AT BOTTOM OF THE THREAD WILL BE EXPRESSED BY THE FORMULA:

$$\textit{diameter} - \frac{1.299}{\text{no. threads per inch.}}$$

In order to make the form and proportions of this standard thread as plain as possible, we have had an enlarged diagram engraved, so as to represent the different parts clearly. x represents the pitch, d the diameter of the screw in inches, v the number of threads to the inch, s the diameter at bottom of thread, m the width of back part of thread at the top and bottom, and z the length of the side of thread.

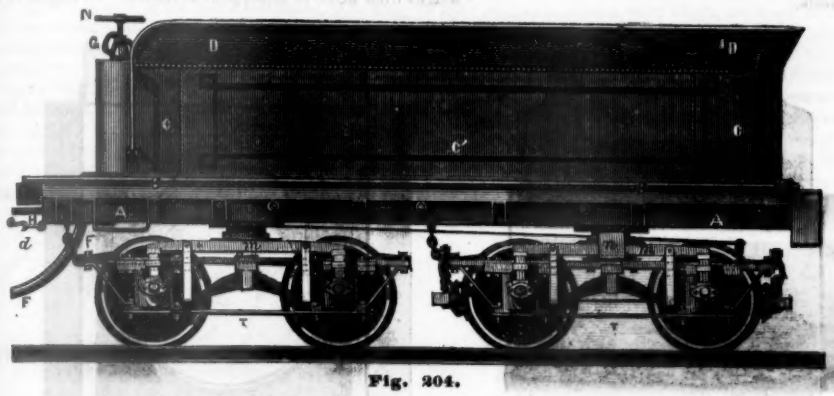


Fig. 204.

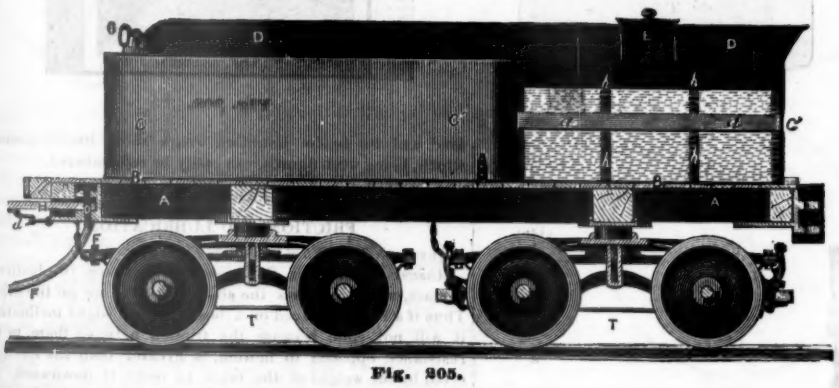


Fig. 205.

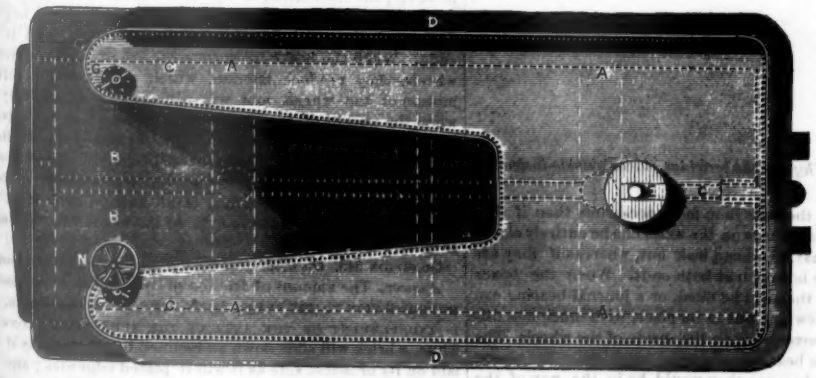


Fig. 206.

Fig. 200.

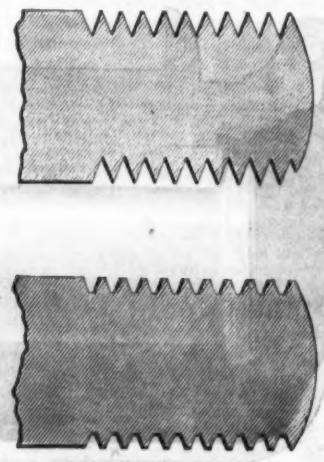


Fig. 201.

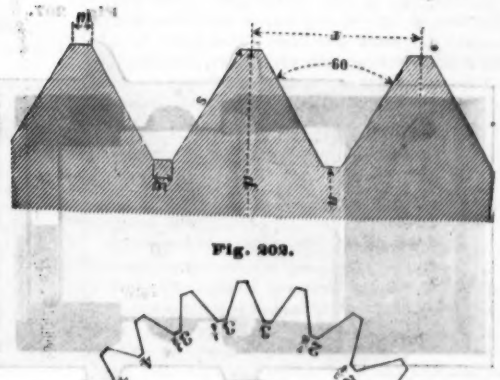


Fig. 202.

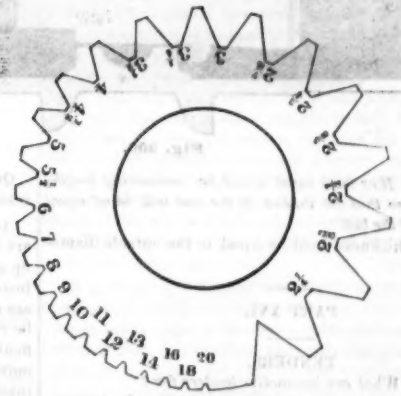


Fig. 203.

From Mr. Sellers' rule the following formulæ can be deduced:

$$s = d - \frac{1.299}{v}$$

$$m = \frac{s}{8}$$

$$z = \frac{3s}{4}$$

From this rule any thread can be constructed, it being only necessary to know the pitch or number of threads to the inch. This with all the dimensions of the standard threads for bolts from ¼ in. to 2 in. diameter is given in the following table.

For practical use in the shop a gauge like that shown in fig. 203 will be found most convenient for grinding the tools to the proper form for making the standard screws.

Wherever this standard thread is used, if any pretense at all is made to accuracy of workmanship, careful attention should be given to the form and proportion of the threads as well as to the number to the inch. In buying taps and dies the purchaser should see that they conform in every respect to the standard, and in making specifications for new work similar care should be exercised to secure the true standard, form and proportions of screws. In many shops the workmen who have the care of those tools are entirely ignorant of the peculiari-

* This can be done by drawing a circle of any diameter, and subdividing the circumference into six equal parts with the radius. Lines, drawn from the points of division will have an inclination of 60 degrees to each other.

ties of the Sellers' system, and have only the vague idea that so long as they get the proper number of threads to the inch they are doing all that is necessary to secure uniformity. Unless, therefore, some care is exercised to insure accuracy of workmanship in this department, the adoption of a "standard" for screws will not insure the advantages which would result from uniformity of screws and threads.

Outside diameter of screw in inches	Number of threads per inch	Diameter of screw at the root of the thread in decimals of an inch	Width of top and bottom of thread in decimals of an inch	Outside diameter of screw in inches	Number of threads per inch	Diameter of screw at the root of the thread in decimals of an inch	Width of top and bottom of thread in decimals of an inch
¼	20	.185	.0062	1	8	.837	.0156
5-16	18	.240	.0074	1⅛	7	.940	.0178
⅜	16	.294	.0078	1¼	7	1.065	.0178
7-16	14	.344	.0089	1⅜	6	1.160	.0208
½	13	.400	.0096	1½	6	1.284	.0208
9-16	12	.454	.0104	1⅝	6½	1.389	.0227
⅝	11	.507	.0113	1¾	5	1.491	.0250
¾	10	.620	.0125	1⅞	5	1.616	.0250
⅞	9	.731	.0138	2	4½	1.712	.0277

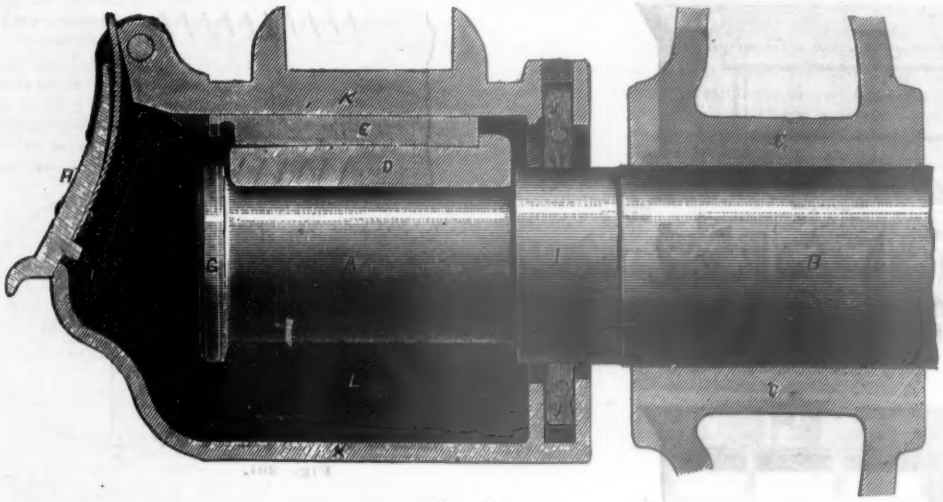


Fig. 207.

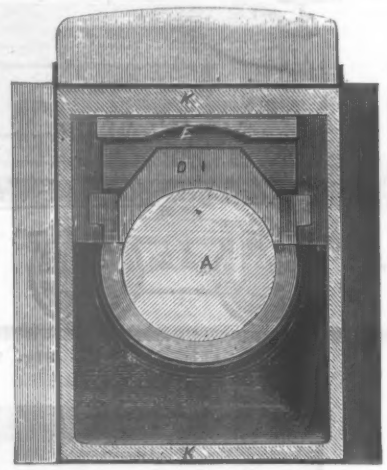


Fig. 208.

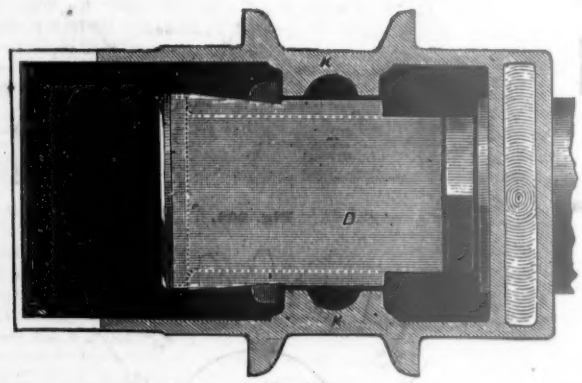


Fig. 209.

QUESTION 334. *How thick must a nut be, measuring lengthwise of the bolt, so that the thread in the nut will be of equal strength to that of the bolt?*

Answer. Its thickness must be equal to the outside diameter of the screw.

PART XVI.

TENDERS.

QUESTION 335. *What are locomotive tenders for?*

Answer. They carry a supply of fuel and water for locomotives while they are running.

QUESTION 336. *How are they usually constructed?*

Answer. Their construction is represented in figs. 204, 205 and 206. Fig. 204 is a side view, fig. 205 a longitudinal section, and fig. 206 a plan of an ordinary tender, which consists of a frame, *A*, *A*, *A*, *A*, made of wood or iron,† mounted on a pair of trucks, *T*, *T*. The top of the frame is covered with planks, *B*, *B*, which form the floor of the tender. On top of this floor a sheet-iron tank, *C*, *C*, *C*, is placed, which carries the supply of water. This tank is made somewhat in the form of a letter ⊃, as shown in the plan. It is made in this way so that the space between the two branches, or "legs," as they are called, *C* and *C*, will give room for fuel. Around the upper edge of the tank a sheet-iron rim, *D*, *D*, is riveted so as to prevent the fuel from falling off when it is filled up above the top of the tank.

QUESTION 337. *How is the tank filled with water?*

Answer. There is a round opening, *E*, called a *man-hole*, on top. Into this the end of a leather or canvas hose is introduced, which is attached to a stationary tank, at a water station, and a stream of water is then allowed to flow through the hose into the tank of the tender.

QUESTION 338. *How is the water conducted from the tender to the engine?*

†The frame represented in the engraving is made of wood. In the plan it is shown by dotted lines.

Answer. To each side of the front end of the tank, one end of a piece of rubber hose, *F*, *F*, is attached, which is connected at the other end to the pipe on the engine which supplies the pump with water. The opening inside the tank through which the water flows to the hose is covered with a valve, which is not shown in the engraving, but which is operated by a lever or handle, *G*. The valve is covered with a hood or strainer, perforated with small holes, which is intended to prevent dirt from entering the hose and thus getting into and obstructing the pump. The hose is connected to the supply pipe by a screw coupling similar to that used with ordinary fire engine hose.

QUESTION 339. *How are the flat sides of the tank strengthened so as to resist the pressure and weight of the water?*

Answer. They are sometimes braced or stayed with rods or bars, *a*, *a*, and *b*, *b*, fig. 205, extending from one side to the other and from the top to the bottom, and angle or T iron is also riveted to the sides to stiffen them.

QUESTION 340. *How is the tender connected to the engine?*

Answer. By the draw bar, *H*, and coupling pin, *o*, fig. 205, and also by the safety chains, *d*.

QUESTION 341. *In what respect do the tender trucks differ from the engine truck?*

Answer. Chiefly in having the journal bearings and frames outside of the wheels.

QUESTION 342. *Why are the bearings placed outside instead of inside?*

Answer. Because they are then more accessible than if they are inside, and the oil-boxes on the axles can be entirely closed up at one end, so that no oil can leak out, whereas if they are inside they must be left open at both ends. When the boxes are on the outside, they can be oiled, or a journal-bearing can be removed and a new one put in its place, with much less difficulty than if the boxes were on the inside of the wheels. The only reason why the bearings of engine truck axles are placed inside the wheels is because they would be in the way of the cylinders if they were outside.

QUESTION 343. *How are the axle-boxes for the tender axles constructed?*

Answer. Their construction is similar to that of a car axle-box, the standard form of which is represented in figs. 207, 208 and 209. Fig. 207 is a section lengthwise of the axle, fig. 208 a section crosswise of the axle, and fig. 209 a sectional plan. *A* is the journal of the axle, *B* the *wheel-seat*, or the part of the axle which is fitted into the wheel, and *CC* is a part of the hub of the wheel. It will be seen that the journal of the axle is inclosed by a cast-iron box, *KK*, which is open in front and at the back. The front has a cover, *H*, which is fastened by a spring, as shown in the illustrations, or it is bolted to the box. The axle enters the box from the back, *I*, and has either a wood or leather packing, *JJ*, called a *dust-guard*, to keep the dust from getting in and the oil from leaking out of the box. *D* is a brass journal-bearing, which rests against a cast-iron bearing piece or *key*, *E*, which is put in so that by removing it through the opening, *FF*, the brass bearing can be raised up high enough to clear the collar, *G*, on the end of the axle and thus be removed in the same way. The lower portion, *L*, of the box under the axle is usually filled with cotton or woolen waste saturated with oil. This constantly presses against the axle, and thus keeps it oiled.

QUESTION 344. *How are the tender trucks constructed?*

Answer. They are made of various patterns, some of which have wooden frames and in other cases the frames are made of iron. The truck illustrated in our engraving, figs. 204 and 205, is made of iron and is very similar to the engine truck, excepting, as already stated, the frames are outside instead of inside of the wheels.

QUESTION 345. *How is the tender supported on the trucks?*

Answer. It rests on the center of the front truck and on a bearing, *n*, fig. 204, on the frames on each side of the back truck. This arrangement gives three bearing points, the advantages of which have already been explained. A truck which supports the load which it carries in the center is said to be *center-bearing*, and if the load is carried on each side, *side-bearing*.

QUESTION 346. *How are the brakes attached to the tender?*

Answer. They are attached usually to the back truck alone, but in some cases to both trucks, and are operated by a wheel, *N*, figs. 204 and 205, and a shaft which extends below the tender frame and on which a chain attached to the brakes is wound.

QUESTION 347. *How much water and coal does an ordinary tender carry?*

Answer. A tender for a thirty-ton engine carries from 1,500 to 2,000 gallons of water and three to four tons of coal, and weighs from 40,000 to 45,000 pounds loaded. An engine of this kind and its tender therefore weigh about 100,000 pounds, which, being even figures, can easily be remembered.

PART XVII.

FRICTION AND LUBRICATION.

QUESTION 348. *What is friction?*

Answer. Friction is the resistance between two bodies in contact, which opposes the sliding of the one on the other. Thus if a brick is placed on a board with a slight inclination, it will not slide because the friction between them, or the resistance opposed to motion, is greater than the force exerted by the weight of the brick to move it downward. If however, the inclination of the board is increased sufficiently so that a larger proportion of the weight of the brick urges it downward, then the friction will be overcome, and it will slide. When the brake-blocks of a car are pressed against the wheels, they produce friction, which resists the revolving motion of the wheels and will ultimately stop the car; and when the weight of an engine is supported on the driving-wheels and they rest on the rails, the friction between them, as has already been pointed out, resists their slipping on each other, and thus enables a locomotive to exert tractive force. Friction also resists the turning of an axle on its journal and therefore makes the tractive force of the locomotive necessary to move a train of cars.

QUESTION 349. *On what does the amount of friction depend?*

Answer. The amount of friction of two bodies in contact IS IN PROPORTION TO THE PRESSURE OF THE ONE ON THE OTHER, AND IS INDEPENDENT OF THE AREA OF THE SURFACES IN CONTACT. Thus, a brick will slide down an inclined board as easily if it is laid on its broadest side as it will if placed edgewise; and if a cast-iron plate, say 10 inches square, is planed and scraped, so as to be as nearly a perfect plane surface as it is possible to make it, it will, if loaded, with say a hundred pounds weight, slide on a similar true surface as easily as another plate with half as much area and loaded with the same weight. A shaft resting against a long bearing will require no more power to turn it than would be needed if the bearing was short.‡

QUESTION 350. *What is meant by the "coefficient of friction?"*

Answer. It is the proportion which the resistance to sliding motion bears to the force pressing the surfaces together. Thus a smooth, clean and dry cast-iron plate loaded with 100 pounds will require a force of about 15 pounds, or fifteen one-hundredths of the weight or pressure of the plates, to slide them on each other. The *coefficient of friction* is therefore said to be 0.15, and with any other weight or pressure on the plates we could determine the force required to slide them on each other by multiplying the pressure by the coefficient of friction. Thus, if the plates were loaded with 250 pounds, the force required to slide the one on the other would be equal to $250 \times .15 = 37.5$ pounds. The coefficient of friction, however, varies for different materials. Thus, while the coefficient of friction between two pieces of smooth, clean and dry cast iron is 0.15, that of a piece of brass on cast iron, under similar conditions, is 0.22, and of two pieces of wood about 0.4.

‡ In fact, ordinarily less power is required to turn it if the bearing is long than if it is short, the reasons for which will be explained hereafter.

Question 351. *What is the effect of introducing some unguent or lubricating material, such as oil, between the surfaces in contact?*

Answer. The coefficient of friction is very much reduced thereby. Thus the coefficient of friction of the cast-iron plates, if their surfaces are greased with tallow, is 0.1; if lubricated with lard 0.07, with olive oil 0.064, and with lard and plumbago 0.055, thus showing that the amount of the friction depends very much upon the nature of the lubricant which is used, as well as on that of the materials in contact.

Question 352. *What effect on the amount of friction has the manner of applying the lubricating material to the surfaces in contact?*

Answer. The more perfect the lubrication the less will be the coefficient of friction. It has, for example, been found by experiments made with cast-iron shafts turning on bearings of the same material that when the lubricating material was applied so that the surfaces were only "unctuous," that is slightly greasy, the coefficient of friction was very little less than when they were dry, and that when they were greased "from time to time" the coefficient was reduced to 0.07 and 0.08; but when they were continually oiled it averaged 0.05, and sometimes fell as low as 0.025, showing that with the best lubrication the friction was only one-sixth what it was when the surfaces were only "unctuous." Between these two limits there is every degree of frictional resistance, according to the condition of lubrication. This shows how important it is that the oiling fixtures should be kept in the most perfect condition and the utmost care be exercised in keeping every part of a locomotive thoroughly lubricated.

Question 353. *What effect does the pressure per square inch of the surfaces in contact have upon the lubrication?*

Answer. The tendency is, when this pressure becomes excessive, to press out the lubricant which is between the two surfaces, and ordinary experience proves that the greater the weight or the force per square inch with which two bodies are pressed together, the greater is the difficulty of keeping them perfectly lubricated.

Thus it is easier to keep the journals of a car well lubricated when it is empty than when it is heavily loaded, and the guide bars of a locomotive are more liable to be cut when the engine is pulling a heavy load than with a light one.

Question 354. *What effect has the velocity of the surfaces in contact on the friction and lubrication?*

Answer. With the surfaces in the same condition, the friction is independent of the velocity of motion of the surfaces against each other; but perfect lubrication becomes more difficult as the velocity increases, so that an increase of velocity will often increase indirectly the amount of friction. Thus, taking our previous illustrations it is more difficult to keep the journals of a car or engine well lubricated when running fast than when running slow, and the same thing is true of the guide bars.

Question 355. *What considerations should govern the proportions of frictional bearings for locomotives and other machines?*

Answer. The dimensions to be given them should not be determined from a consideration solely of their resistance to rupture,§ but they should be made so large that the pressure they must bear will be distributed over so much surface that the portion borne by each square inch will be comparatively small, thus making good lubrication much less difficult, and consequently reducing the coefficient of friction.

Question 356. *Is not the amount of energy required to overcome the friction on a journal of large diameter greater than would be required if the journal was smaller.*

Answer. If the coefficient of friction in the two cases is the same, undoubtedly the large journal will require the greatest expenditure of energy to turn it, because its periphery moves further than that of the small one, but the advantage attributed to large journals is that they can be lubricated more perfectly, because the pressure is not so great per square inch, and thus the gain from the reduction of the coefficient of friction is greater than the loss attributable to the increase of the diameter of the journal. Thus if a car journal is 3¼ inches in diameter × 5½ inches long, the available surface exposed to friction is equal to that of a longitudinal section of the journal, or 3¼ × 5½ = 17.875 square inches. Supposing now that the journal is loaded with 5,000 pounds, and the average coefficient of friction is 0.085. In one revolution of the wheel the journal will move 0.85 of a foot, and therefore 5,000 × .085 × .85 = 361¼ foot-pounds of work. If now the journal is made, as has been proposed, 3¾ × 7 inches, then its effective surface will be equal to 26¼ square inches, but the journal will move 0.98 of a foot in one revolution. If, however, the lubrication is improved by the increased area of the journal so that the coefficient of friction is reduced from 0.085 to 0.07, then the energy consumed in one revolution will be equal to 5,000×.07×.98=343 foot-pounds, or less than was consumed with the small journals. The coefficient of friction is assumed, and could only be determined by experiment, but the assumption shows how the resistance of the large journals may be less than that of the small ones. Of course it would be better to give the increased bearing surface by adding to the length of the journal, but nearly all locomotive and car journals must be increased in diameter as well as in length when they are enlarged, in order to have the requisite strength to carry the loads they must bear.

§ Morin's Mechanics.

Question 357. *Is the law that* FRICTION IS IN PROPORTION TO THE PRESSURE ON EACH OTHER BY THE SURFACES OF CONTACT *true under all circumstances?*

Answer. No; there is a limit to the exactness of the above law, when the pressure becomes so intense as to crush or grind the parts of the bodies at and near their surfaces of contact. At and beyond that limit the friction increases more rapidly than the pressure;‖ and the friction then becomes very irregular.

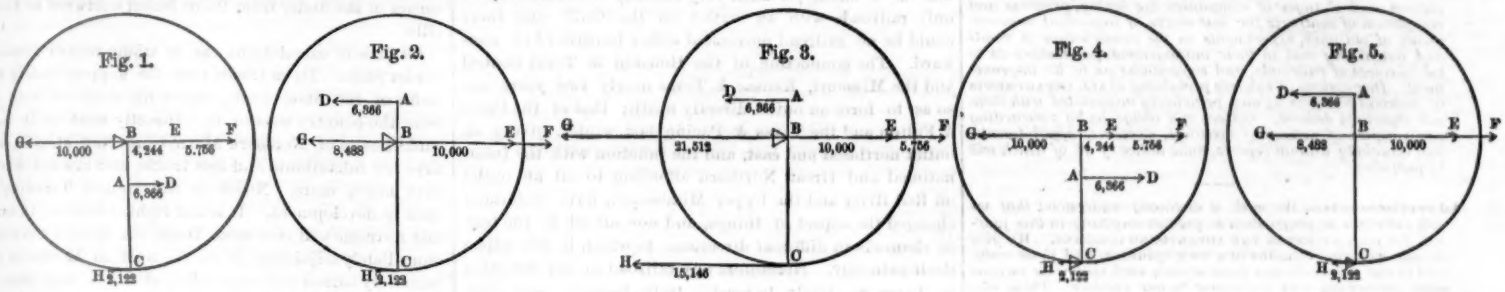
‖ Rankine.

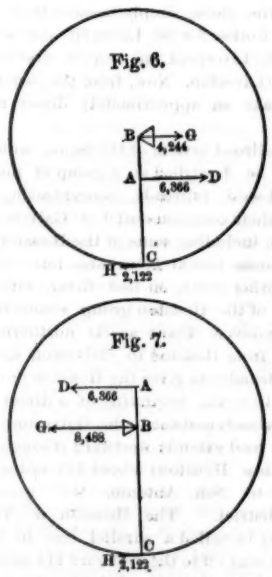
Question 358. *In what cases is the limit referred to probably reached?*

Answer. Probably in some locomotives the pressure of the driving-wheels on the rails is sufficient to partially crush the latter.

Question 359. *What effect has the nature of the materials in contact on the friction?*

Answer. The amount of friction and also the lubrication is very much influenced by the nature of the bearing surface and also by the material used as a lubricant. Some metals, such as brass and other alloys, are much less liable to abrasion and seem to retain lubricants on their surfaces better than other metals, and are therefore much used for journal and other bearings. Some substances, especially oils, are good lubricants, while other materials of apparently similar nature are not. The reasons why these materials possess these properties while others are without them is not known, and the value of any material as a lubricant, or the degree to which another will resist friction without abrasion, can only be tested by experiment.





The Action of the Forces Which Move a Locomotive.

To the Editor of the Railroad Gazette:

In the "Catechism of the Locomotive" published in the Railroad Gazette for July 25, 1874, there are some statements that do not agree well with the generally received notions in reference to the action of forces on a lever. The propositions that seem questionable are the following:

1st. That when the crank is above the axle, the pressure on the piston is the moving force; and that when the crank is below the axle, the reaction of the pressure on the piston is the moving force.

2d. That it is immaterial whether the center of the axle or the point of contact of the driver with the rail is the fulcrum of the lever.

Now if it should appear that the conditions vary, as the point which is regarded as the fulcrum is changed, and that the conditions in either case are not compatible with the principles of the lever, it will be fair to assume that the propositions are not correct—this mode of proof, known to logicians as the *reductio ad absurdum*, being generally accepted as conclusive.

The principles of the lever referred to, which may be found in any good treatise on mechanics, are as follows:

If the forces acting on a lever are parallel, the intensity of the resultant is equal to their algebraic sum; and if the forces are in equilibrium, the resultant acts at the fulcrum. It will obviously simplify the discussion to suppose that the forces acting, in the case of a locomotive, are in equilibrium, so that the machine is moving with uniform velocity. The same data will be assumed as are given in your example, viz.:

Mean pressure on piston, 10,000 pounds.

Mean reaction on cylinder-head, 10,000 pounds.

Stroke of piston, 2 feet.

Diameter of driver, 6 feet.

It will be sufficient to consider the action of one cylinder, and its effect upon a single driver. On account of the different spaces passed through by the piston and crank-pin in the same time, the mean pressure upon the crank-pin will be about 6,366 pounds, and the mean tractive force exerted at the tread of the driver about 2,122 pounds. On the supposition made in your article, a graphical representation of the forces in action, when the crank is below the axle, and the fulcrum is at the center of the axle, would be as shown in fig. 1. *A D* is the force of 6,366 pounds acting on the crank-pin, *C H* is the tractive force, *B G* is the reaction of the cylinder-head, *B E* is the force said to be exerted by *A D* at *B*, and *E F* is the resistance of the train, which is equal to the unbalanced pressure on *B*—so that the locomotive overcomes a resistance greater than that due to its tractive force. But by the principle of the lever, enunciated above, all these forces being in equilibrium, the unbalanced pressure at *B* is

(6,366 + 4,244 + Resistance of train)
—(10,000 + 2,122), or

Resistance of train = 1,512 pounds, less than the tractive force of the locomotive. Either of these conclusions conflicts with the supposition that the forces are in equilibrium, or that the resistance of the train is equal to the tractive force. If the crank is above the axle, as shown in fig. 2, the result will be still more anomalous; for supposing the forces to act as stated in your article, it appears that the unbalanced pressure on the axle tends to move the train backward, and it would be necessary to have a tractive force of 15,146 pounds at the tread of the driver, as represented in fig. 3, to overcome the resistance of 5,756 pounds. Like letters refer to like parts, in the three figures, and it will be easy to verify the calculations, the insertion of which would make this letter too long. The same anomalies will occur, if the fulcrum of the lever is placed at the point of contact of the driver with the rail, as will be sufficiently evident from an inspection of figs. 4 and 5. The fallacies which give rise to these strange conclusions seem to be as follows:

1st. That the resistance of the train is overcome at the center of the axle.

2d. That the reaction on the piston head is a moving or retarding force, as the case may be.

3d. That it is a matter of indifference whether the fulcrum is taken at the center of the axle or at the rail.

The writer believes that the true principle of the action of the locomotive is the same as if the locomotive was fixed, and drew the train by means of a rope or chain wound round the driver. In this case, when the crank is below the axle, *A D*, fig. 6, represents the moving force, and *C H*, the resistance of the train, and the relative distribution of these forces, when the crank is above the axle, is shown in fig. 7. It will be observed that in either case the pressure on the axle-box is greater than the resistance which is overcome; and it is difficult to imagine how, when the locomotive is placed upon a track, if there is sufficient adhesion to prevent the slipping of the driver, so many new conditions and forces are introduced, as represented in figs. 1 to 5.

In conclusion, it may be well to give a simple practical illustration. It would hardly be seriously contended that, other things being equal, a locomotive with vertical cylinders is less efficient than one in which the cylinders are horizontal. But when the cylinders are vertical, the reaction of the cylinder-heads, which is represented as being a force that tends to produce motion, acts, if the locomotive is on a level track, continually at right angles to the direction of the motion, and consequently has no moving effect. Some curious results arise from the application of the statements in your article to this case, but this letter is already too long to permit of their consideration. It will probably be evident at a glance that the principle of reaction as a moving force must be abandoned, in a case of this kind, and that the locomotive with vertical cylinders is dependent for its motion on the force exerted by the piston on the crank-pin, unthwarted and unassisted by the reaction on the cylinder-heads.

Richard H. Buel.

[We publish the above communication without comment, in order to leave the subject open for discussion, which we invite from correspondents.—Editor Railroad Gazette.]

A Dangerous Improvement.

An engine on the New Jersey Midland road has been fitted with a smoke-burning arrangement in the fire-box. On one of the early trips of the engine as the fireman opened the furnace door to throw in a shovelfull of coal, the gas burst out with such volume and force as to throw him entirely off the engine. In falling he struck on his head in a culvert and was killed. Another fireman was put on in the dead man's place, and in a short time he had his face terribly burned. One would suppose it would now be rather difficult to find a fireman for that engine.

RAILROAD GAZETTE

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Editorial Announcements.

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

TEXAS RAILROADS.

Texas is an empire in itself, it is common to say, and often this is taken as sufficient ground for the assumption that it offers an extraordinary field for enterprise and wealth. But mere extent of territory, of course, helps not a whit. It is the use we can put it to which is the important thing, and money and labor can be buried uselessly in a large as easily as in a small field. When we speak of Texas, therefore, we should only bear in mind that it is a more extensive term than Kansas or Nebraska, and compares more fitly with less definite terms like "the Northwest," "the Ohio Valley," or "the Lake Basin." Its extent, however, has considerable importance in studying it as a field for transportation enterprises, as it evidently of itself gives abundant room for long lines, and a large part of it can only find a market by the use of such lines.

The natural outlets of Texas are, first and chiefly the Gulf coast, which stretches in a southwesterly direction from the mouth of the Sabine to the Rio Grande and the Mexican border, some four hundred miles. And this coast is of more value to it than an ocean outlet would be to most of our States, because a very large part of the produce for export seeks a foreign market, and must cross the sea somewhere. It has not many harbors, and no good ones, and Galveston is the only one which makes considerable shipments, though perhaps the others, such as Corpus Christi and Indianola, would do more if they had any considerable connections with the interior. There are a great many large rivers which empty into the Gulf, but most of these are unnavigable for a large part of their course a large part of the year, and they are not really of much value as outlets. Next to the Gulf, doubtless, the Red River is the most important natural outlet of the State. It reaches it near Jefferson, about 50 miles south of its northern border, and for several hundred miles separates it from the Indian Territory. Navigation is rarely seriously obstructed below Jefferson, but though boats run above about 200 miles, and have always carried the largest part of the cotton and grain exports of Northern Texas to market, the navigation is irregular and frequently interrupted. Thus this stream practically reaches only the border of the State, and nearly the whole of its immense territory is destitute of trustworthy natural water routes. There are no such streams as the Hudson, the Ohio, or even as the Tennessee, the Illinois and the Tombigbee. Roads are needed to bring the exports of the State as far as its borders to a greater extent perhaps than in most parts of the country.

In designing a railroad system for any district, we should first know the places to which the products and from which the supplies of that country move. Too many north-and-south railroads to carry a traffic which insists on moving east and west have taught this lesson pretty thoroughly. In Texas, as in most agricultural districts which produce their own food, the exports greatly exceed the imports in bulk, and so determine the routes of transportation. Now Texas sends its produce not in one direction, like most States, but in no less than three. These products (for export from the State) are chiefly cattle and cotton. Now the cotton nearest the coast seeks the Gulf harbors for transportation to the manufacturers' market either in Europe or the Eastern United States or to a secondary market at New Orleans, while that of the north before the days of railroads was taken to the Red River for shipment to New Orleans. The cattle find their chief market in the Northeastern States, which they have reached by going first northward (on foot) across the Indian Territory to the Kansas railroads, though shipments by vessels are also made to New Orleans and West Indian markets. Thus we have the products of the State flowing in three great channels, southward to the Gulf, eastward to New Orleans and the other Southern States, and northward or northeastward to the consuming districts of the Northern States.

In Texas, therefore, there is demand for at least two kinds of railroads, one north and south, for carrying produce in both these directions, and the other east and west, for eastern outlets. As to the relative importance of the two classes we have no sufficient experience to take as a basis, for until very recently the State has had only railroads with an outlet on the Gulf, and there could be no railroad movement either northward or eastward. The connection of the Houston & Texas Central and the Missouri, Kansas & Texas nearly two years ago so as to form an outlet directly north; that of the Cairo & Fulton and the Texas & Pacific last winter, giving an outlet northeast and east, and the junction with the International and Great Northern affording to all an outlet on Red River and the Upper Mississippi, have materially changed the aspect of things, and now afford to the traffic channels in different directions to which it will adjust itself naturally. Heretofore any railroad in any direction in Texas was likely to receive traffic bound to any quarter of the globe, simply because there was no other route for it. Cotton for St. Louis (if any went there then) as well as to Liverpool was carried first southward to Houston or Galveston. Now, from the eastern part of the State it can take an approximately direct route to its destination.

The railroad system of the State, so far as it is developed, may be described as a group of north-and-south and east-and-west railroads, concentrating at Houston but having their common outlet at Galveston; another group of roads, including some of the Houston group, leading to the Arkansas line at Texarkana, but with an outlet also a little further south, on Red River, with a single important line of the Houston group connecting with the Missouri, Kansas & Texas as its northern outlet. A single railroad from Houston to Galveston and a bayou navigable by steamboats gives the Houston group its Gulf outlet. A short line (the beginning of a direct route to New Orleans) extends eastward; the Galveston, Harrisburg & San Antonio road extends westward (though from a point five miles below Houston) about 125 miles, and is being extended to San Antonio, the great center of the cattle district. The Houston & Texas Central has what may be called a parallel line in its Austin Branch, which is sent off to the westward 114 miles by the main line after the latter has extended 50 miles northwest of Houston. There are two lines to the northward, the Houston & Texas Central, before named, which reaches the Red River and the Missouri, Kansas & Texas Railway 341 miles from Houston, 291, from the junction of the Austin Branch, being nearly due north; and the Houston & Great Northern, which extends from Houston to Palestine, where the International, with which it is now consolidated, extends it further northward and gives it an eastern as well as a northern outlet.

The latter is the most southerly of the roads leading to the East, but its direction separates it from those lines, or rather unites it to those leading to the north also. Extending nearly due southwest from near the northeast corner of the State, it will when completed make a route entirely across the State to the Mexican border on a line about 600 miles long, through cotton and grain districts and the very heart of the cattle district. This line will afford the most direct outlet for the country on its line to all that part of the North east of the Mississippi (and some west of it), and also an eastern outlet to the Red River, to Memphis, and to all the Atlantic coast from Savannah northward, which latter will be almost the shortest possible if the line from Shreveport to Vicksburg is ever completed. It thus serves a double purpose, and forms an outlet for all the products on its line, carrying as it does both cotton and cattle towards their markets. Moreover this line gives to both of the north-and-south roads an eastern outlet for their traffic, and secures that traffic from the Houston & Great Northern which is bound northward as well as eastward. So all that part of it east of the Houston & Texas Central is a favorable line for carrying traffic to the Gulf, and the International, therefore, may carry traffic in all three of the prevailing channels. Of this road 204 miles is completed, from Longview southwest to Rockdale, a hundred miles of the Texas & Pacific serving to connect it with Texarkana.

The two lines of the Texas & Pacific, the one completed from Shreveport, La., west to the Houston & Texas Central at Dallas, 186 miles, and the other the "Transcontinental Division," about half completed from the Houston & Texas Central at Sherman, near the northern border of the State, eastward toward Texarkana, are the other lines giving an eastern outlet. The 75 miles from Marshall north to Texarkana, uniting these two lines, gives a northern railroad outlet to the southern and a river outlet to the northern.

This briefly describes the railroad system of Texas, or at least the skeleton of that system. Connecting members are the line from Houston southwest to Columbia, 50 miles, owned now by the International & Great Northern, a short branch (8 miles) of the latter to Huntsville, and another 44 miles long which connects the International proper with the Texas & Pacific, (Troupe to Mineola); also a branch 45 miles long extending southeastward to the Houston & Texas Central. Outlying members are the Gulf, West Texas & Pacific, 70 miles long, from the Gulf at Indianola northwest to Cuero (aiming for San Antonio), and the Rio Grande Railway, in the extreme southwest corner of the State, from Point Isabel westward to Brownsville.

All present calculations as to traffic regard Texas as a border State. Its railroads look for support solely to the traffic of the State itself, expecting none or very little from the country west of it. Directly west of it lie the wildernesses of Northern Mexico and New Mexico, which have few inhabitants and less traffic, and are not likely to have much more. North is the Indian Territory, not open to development. It is not right, however, to assume that no traffic will ever cross Texas, for though the country immediately adjoining it on the west in Mexico is comparatively barren and unpeopled, at not a very great distance to the southwest is a productive and thickly peopled district, with numerous large cities and towns—the heart of the Republic of Mexico. It is true that there has been heretofore so little communication between Mexico and Texas that we hardly think of them as neighbors, but this infrequency of communication is doubtless due to a considerable extent to the former isolation of Texas itself, and further to the lack of a railroad between the two countries. Texas now is so connected with the rest of the country that whatever we have to sell the Mexicans may be brought almost to their doors, and whatever they have to sell us may be received there. With the International or other Texas road extended to the Rio Grande and a Mexican railroad from the center of population to meet it there, we may see the beginning of a movement in traffic which will do much towards supporting some at least of the Texas railroads.

The traffic of the State now is likely to be distributed somewhat as follows: The cotton, doubtless, will continue for the most part to take the cheapest route to cotton ports, and most of it will go to Galveston. Some now moves northward, and a direct rail route to New York and New England is open to all of it, but this necessarily is long and costly. The grain of North Texas, where wheat as well as corn is said to be grown as plentifully and cheaply as in the Northwest, has not hitherto sufficed for the consumption of the State, probably, but then until recently most of the State has been inaccessible to it. For some time, doubtless, this will find a good market in the State and will be carried southward by the railroads, or will reach another southern market at New Orleans and will move eastward by rail to the Red River.

The cattle, which must largely exceed in bulk any other exported product of the State, still go for the most part a large part of their way to market on their own hoofs, being driven to Kansas for shipment, and it is doubtful how far this practice will be changed by the approach of railroads near to or into the cattle district of West Texas, as the journey to Kansas affords pasture, and to cattle not already fat gives new feeding grounds at a time when Texas pastures are apt to be pretty well dried up. But it is reasonable to expect that the fat cattle will take one of the two railroad routes to the North. To reach these a variety of routes are open. The lines which approach the chief cattle district nearest are the Austin Branch of the Houston & Texas Central, the International, which will probably reach Austin by the close of the year, and the Galveston, Harrisburg & San Antonio, which is completed to a point about as far west as Austin, but about a hundred miles further south. The two last-named are to be extended to San Antonio eventually. Of these the International offers much the shortest route, it with its connections forming a line almost straight from Cairo to Austin. It has a break of gauge

at the Arkansas line, but this does not matter much in cattle transportation, as the animals must be unloaded for rest and feeding more than once before reaching the market. As the rates will of course be about the same by all routes, this may not prevent the other roads from obtaining their full share of the traffic. The interests of the Texas Central will incline it to carry its stock to the Missouri, Kansas & Texas, and this will be the only rail route for that large amount of stock which is taken to Kansas or further north to be wintered or pastured for some months. The Galveston, Harrisburg & San Antonio will have to depend upon either the Texas Central or the International & Great Northern for its outlet, the former being the shortest.

Although there has been a large increase in the railroads of Texas within two or three years, they are still by no means crowded. You may now travel over many routes three or four hundred miles long through generally fertile districts in that State without crossing a railroad. Traffic is light as yet, but the nature of the country and the character of its productions and its progress heretofore render it probable that it will in time afford a larger amount of products per square mile for transportation than any other part of the South. It is fortunate in being productive in grain as well as cattle, and it is thrice fortunate and distinguished above all other cotton-growing districts in being rich in grass, and consequently able to raise live stock profitably, and renew the waste of soil incident to constant cropping, which in almost every other Southern State has changed vast extents of fertile fields into barrenness. Moreover, it has what no other Southern State has, a large and constant influx of immigrants. Its political condition is more stable and satisfactory to its people than that of almost any other Southern State. It has a very small public debt, an immense estate in fertile public lands, and better credit than most of its neighbors.

Doubtless it offers still a promising field for railroad enterprises, though of course it will be easy to waste money there as elsewhere by building railroads before their time. But the nearness of seaports to the whole State make it reasonably certain that its distance from market will never be an obstacle to profitable cotton-growing in any part of the State where the soil is suitable and a railroad is accessible. All or nearly all of the roads which it has are well placed, and though some of them may be poorly supported now, all the longer ones must before long be decidedly profitable. Only the Texas & Pacific, we believe, now fails to meet its obligations, and its misfortune is due to financial difficulties met during construction. There is almost sure to be a great development of railroads in Texas hereafter, and if they are planned reasonably and not constructed too soon, they may be made to the profit of the investors as well as to the immense advantage of Texas.

Locomotives and Train Brakes.

In another column our readers will find two circulars of committees of the Master Mechanics' Association. As the Secretary in his letter very justly says, the appearance of these circulars so early in the year indicates that the members, at least some of them, have not forgotten their promises.

The two subjects are certainly of sufficient importance and interest to furnish material for good and valuable reports. The committee on "Construction of Locomotives" is one which, we think, should be a permanent committee, reporting every year, so that it would thus furnish a contemporaneous history of the progress of this branch of engineering. Such a series of reports would not only have very great present value, but would be extremely useful in future. As we have taken occasion frequently to say, there is no department of railroad operation in which there is more opportunity for economy than in that of locomotive performance. Owing to the careless way in which locomotive reports are in some cases kept, or not kept, as the case may be, and the inaccurate system on which they are all based, it is almost impossible to form any idea of the relative expense of operating these departments or of knowing which is doing its work economically and which the reverse. The fault of this lies, we believe, not with master mechanics so much as with those who control expenditures, and who do not realize the great difference in the performance of engines when working economically and when the reverse is the case.

The many directions, too, in which locomotives are capable of improvement is indicated by the circular of the committee. If they had numbered each inquiry, it would have made it easier to reply to them, and been more convenient for reference.

The circular of the "Brake Committee" is a model of pertinent interrogation, and if it succeeds in getting correct replies—and we do not see why it should not—and simply embodies them in its report, the latter will be extremely useful. It is very desirable to know the advantages, expense of maintenance, and first cost of the different brakes in use; but at the same time it is useless to attempt to disguise the fact that the consideration of the subject is beset with some dangers to the Association which doubtless the committee will be able to avert, but which it will not be so easy to steer clear of in the heat of public discussion. What we want to do here is simply to point out the fact, and in that way anticipate and thus avoid the danger.

If the other committees act as promptly and do their work as well as those which have already acted, and then if the members will be equally prompt to respond, the Association may anticipate a more brilliant convention next year than any which has preceded it.

Explanation.

It is but just to Mr. John Griffin to say that his name was appended to the report of the "Rail Committee" published in last week's GAZETTE without his authority, and through an error in this office, which occurred by copying the names of the members of the committee from the original notice of their appointment.

A GREAT COMBINATION is talked of by certain newspapers, including the Baltimore & Ohio, the Pennsylvania and the Erie for the purpose of getting control of the Canada Southern, completing the Chicago & Canada Southern to Chicago, working this road as the sole Chicago connection of the Erie and so (in some way which we do not understand) dealing a deadly blow to the Lake Shore and the New York Central. As to what the combining parties would gain by the plan, not much is said, the intention apparently being to show that somebody would be hurt rather than that anybody would be benefited—always excepting the Canada Southern, which will be benefited by anything that brings it traffic. It doubtless would be a good connection for the Erie, if completed to Chicago; but the Erie is paying rent for another railroad which brings it within 280 miles of Chicago, and it will need to direct all the traffic it can to that line. The Pennsylvania cannot very well make any use of the Canada Southern line; neither can the Baltimore & Ohio, which, moreover, is building a line of its own to be completed this year.

RUSSIA, according to the *Journal de St. Petersbourg* of June 18, is about to make great extensions of its railroad lines. Eighteen new lines are projected with a total length of 3,450 miles, about half of which are to be begun immediately. Our locomotive builders, it is to be hoped, will be able to secure contracts for a good part of the equipment of these new lines. They seem to be able to manufacture engines quite as cheaply per horse-power as European builders; they can hardly be said to have competitors for engines burning anthracite coal, which is the cheapest fuel in a considerable portion of Russia, and their work is already well known and approved in that country, and, probably, is better adapted to the Russian roads than that of European builders.

NEW PUBLICATIONS.

The Railroad Quarterly.—The Executive Committee of the Railway Association of America announces that it will issue a number of its proposed quarterly journal in August, printing whatever copies may be ordered before August 1, and charging the cost price therefor. The contents will be an address of the Executive Committee, an original article by Mr. H. S. Haines, General Superintendent of the Atlantic & Gulf Railroad, entitled "Reasonable Rates of Car Hire;" "Relative Cost of Transporting Local and Through Traffic," by Albert Fink, Vice-President and General Superintendent of the Louisville, Nashville & Great Southern Railroad, which will form a part of his forthcoming book on the cost of transportation, "Cost of Railroad Transportation," a reprint of the published portion of Mr. Fink's forthcoming book, being that relating to transportation by passenger trains, a large part of which has appeared in the RAILROAD GAZETTE (pages 199 and 212 of the current volume); Mr. Chanute's "Elements of the Cost of Freight Traffic," which is published on page 109 of this volume of our paper; the paper of Martin Coryell, C. E., read at the Louisville Convention of the American Society of Civil Engineers, "Production of Freight, Traffic and Transportation of Freight and Passengers," with the discussion thereon, the part of which relating to railroads was published in our last volume, page 461; "The Carriage of Food, Coal and Raw Materials," reprinted from the first report of the Massachusetts Railroad Commissioners (1870), and "The General Railroad Discussion," from the last Massachusetts report (published in the RAILROAD GAZETTE on page 60 of this volume). All these together will make quite a volume, and nearly all are very valuable, worth preserving, and out of print or not easily accessible at this time.

The Master Mechanics' Association—Circulars of Enquiry.

American Railway Master Mechanics' Association,
Secretary's Office,
CINCINNATI, July 24, 1874.

TO THE EDITOR OF THE RAIL OAD GAZETTE:

Inclosed please find two copies of circulars soon to be issued from this office to the master mechanics of America.

The appearance of these circulars so early in the year is an indication that the promises made by many of the members at the last convention have not been forgotten, and that we are to have highly interesting and well digested reports at the next annual meeting.

In this connection the Secretary desires to call the attention of members to the importance of seeing that their correct address is in the Secretary's office. It is not enough that they may have mentioned the fact of their having changed at the convention. They should write and give their *full address* and initials of the road they represent, that it may be kept on file for reference. This of course is only necessary where association mail matter is not received, or is without the proper address; but in cases of this kind the matter should receive immediate attention, as the manuscript for the Seventh Annual Report is now in the hands of the printer, and all corrections in the official list of members must be made very soon.

J. H. SETCHEL, Secretary.

PLEASE REPLY TO THIS CIRCULAR ON OR BEFORE AUGUST 1.

DEAR SIR: At the last meeting of the Association, held in Chicago, the undersigned were appointed a committee on the

"CONSTRUCTION OF LOCOMOTIVES."

The object of the Committee being to present to the convention at its next session such new methods of construction as have been adopted by members during the past or present year, which have *proved* to be *real improvements*.

In furtherance of this object, your Committee earnestly hope (their subject being a general rather than a specific one,) that all members who have made any positive improvements coming within the scope of your Committee's subject will present to us in a manner as clearly and briefly as possible the nature of such improvements, exact method of construction, and wherein the improvement is positive and valuable.

Your attention is directed to the following questions:

What improvements have you made in the construction of locomotive boilers, particularly in reference to the saving of fuel?

Have you had any experience with the so-called "Weston Patent Boiler?" If so, with what results as regards economy of fuel, facility of making steam, cost of construction and maintenance, compared with the ordinary form of boiler?

Have you had any experience with the Jauriet fire-box, and with what results as compared with the brick arch?

Please give results of any experience with the so-called Buchanan's water table?

What, if any, improvements have you made in valves, or machinery for working the same, resulting in a marked saving of fuel or repairs?

What improvements in the construction of locomotive trucks under front end of engines, and what advantage gained?

Have you found a perfect spark arrester or smoke consumer, meeting all requirements? If so, please give detailed description of same, length of time used, and with what results?

Have you had any experience in using over 140 lbs. pressure of steam? If so, state results.

Have you had any experience with engines of either Farlie's or Forney's design? Do you consider the rigid wheel base of an average American engine sufficiently destructive to justify attempts to work out either of the designs referred to?

Please describe any improved methods of construction of locomotive engines, or any parts of the same, practicable and of real value, the knowledge of which would be of advantage to our fraternity generally?

It is to be hoped each member will give the subject of this circular careful consideration, and contribute such facts as they may be possessed of, known to be of practicable and general value.

Your Committee do not care to present new methods which do not possess *positive advantages* over the old or usual method.

JAMES SEDGELY, Gen. M. M., L. S. & M. S. Ry.,
L. S. YOUNG, Gen. M. M., C. C. C. & I. Ry.,
HOWARD FRY, Supervisor of Motive Power, Erie Ry.,
Committee.

Address replies to James Sedgely, Gen. M. M., L. S. & M. S. Ry., Cleveland, Ohio.

DEAR SIR: The undersigned, a Committee appointed at the last annual convention of the American Railway Master Mechanics' Association to report on the

"CONSTRUCTION AND IMPROVEMENTS OF CONTINUOUS TRAIN BRAKES, DURING THE ENSUING YEAR, AND THEIR APPLICATION TO CARS AND LOCOMOTIVES,"

Invite your attention to the following questions, and respectfully request you to reply to the same:

1. What system of continuous brakes is in use on your line? Please describe the same, unless it should be of the following patents, the construction of which is known to the Committee, viz.: The Westinghouse and Loughridge compressed air and the Smith vacuum brake?

2. State the advantages and disadvantages which have been developed in the use of the brake on your line, and the cost of its maintenance for the year previous to your making your return to t is circular. Give the cost of repairs (not including those arising fro accidents) upon engines and cars, and if you have not the latter data, will you please obtain the same from the person in charge of the car department?

3. Have you any record of accidents caused by a failure of the brake to act at a critical time, and if so, state nature and extent of same?

4. Can you furnish any instances of extraordinary stops being made by the brake on regular passenger trains, by which accidents have been avoided or mitigated?

5. Is there an automatic device attached to your brake system, by which the rear section of a train, in case of disconnection, may be brought to a stop, and do you consider such a feature essential?

6. Do you experience any difficulty in starting the train after making a stop with the brake?

7. What is your experience, or the person having charge of the car department, in regard to the durability of car wheels, by the use of the power brake, as compared with the old-hand brake system?

8. Do you know of any improvement by which the brake in use on your line could be made more effective or less expensive in maintenance?

9. What is your experience, if any, in regard to application of the power brake to the driving wheels of locomotives?

The answers to this circular should be returned to this Committee not later than the 1st of March, 1875, as the Committee are obliged to make a report on the 1st of April to the Secretary.

CHAS. R. PEDDLE, Vandalia Line, Chairman.
F. GOULD, Missouri, Kansas & Texas Railway.
G. B. RICHARDS, Boston & Providence Railroad.
Committee.

Please address replies to Chas. R. Peddle, M. M., St. L. V. T. H. & I. R. R., Terre Haute, Ind.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—Mr. J. A. Beauvais, of New Bedford, Mass., is President of the newly organized Fall River Railroad.

—Maj. D. W. Washburn, formerly assistant Engineer on the International, has succeeded Mr. R. S. Hayes as Engineer in charge of construction on the Texas & Pacific.

—At a meeting held at Eau Claire, Wis., July 9, the Chippewa Valley & Red Cedar Railroad Company was organized by the choice of the following directors: Capt. Wm. Wilson, A. Tainter, Menomonee, Wis.; O. H. Ingram, H. P. Graham, G. A. Buffington, D. Shaw, H. C. Putnam, G. E. Porter, R. F. Wilson, J. G. Thorp, Eau Claire, Wis.; Thad. C. Pound, L. C. Stanley, Chippewa Falls, Wis.; T. B. Wilson, Reed's Landing, Wis. The board subsequently elected officers as follows: President, Wm. Wilson, Menomonee, Wis.; Vice-President, O. H. Ingram, Eau Claire, Wis.; Treasurer, H. C. Putnam, Eau Claire, Wis.; Secretary, C. R. Gleason.

—Mr. O. S. Pease, at one time General Superintendent of the Indianapolis & St. Louis Railroad, has been appointed Superintendent of the Illinois & St. Louis Bridge.

—Mr. J. W. Moak, General Superintendent of the Rome, Watertown & Ogdensburg Railroad, has been appointed to the same position on the Syracuse Northern Railroad, which has recently passed under the control of the Rome company.

—Mr. Frank K. Hain has been appointed Superintendent of the Motive Power of the Erie Railway, having charge of cars, rolling stock and machinery. Mr. Hain was formerly foreman of the erecting shop at the Baldwin Locomotive Works, and not long ago visited Russia in the interests of the works.

—At the annual meeting of the Niagara Falls Suspension Bridge Company, July 6, the following directors were chosen: John M. Hutchinson, John S. Ganson, Buffalo, N. Y.; Delos DeWolf, Samuel B. Johnson, Oswego, N. Y.; Charles H. Smythe, Clinton, N. Y. The board elected Delos DeWolf, President, and Charles H. Smythe, Secretary and Treasurer.

—At the annual meeting of the Clifton Suspension Bridge Company, July 7, the following directors were elected: John M. Hutchinson, John S. Ganson, Buffalo, N. Y.; Delos DeWolf, Samuel B. Johnson, Oswego, N. Y.; Charles H. Smythe, Clinton, N. Y. Subsequently the board elected the following officers: President, John M. Hutchinson; Secretary and Treasurer, Charles H. Smythe.

—The Texas Midland, Gulf & New Orleans Railroad Company was organized at Waco, Tex., July 6, by the electi n of the following directors: W. A. Taylor, D. T. Chamberlin, O. E. Battle, G. C. McGregor, Waco, Tex.; J. B. Robertson, Houston, Tex.; Joseph U. Orvis, Norman A. Smith, New York; J. N. Harrington, James McKaye, London, England. The board subsequently elected the following officers: President, James McKaye; Vice-President, W. A. Taylor; Assistant Treasurer, D. T. Chamberlin; Secretary, I. C. Colton, New York.

—Mr. Charles H. Winfield has been appointed Receiver of the Monticello & Port Jervis Railroad.

—The board of directors of the Pennsylvania Railroad Company has completed the organization of the Treasurer's department by the following appointments, to take effect August 1, 1874: Bayard Butler, Treasurer, in place of Edmund Smith, elected Second Vice-President; John D. Taylor, Assistant Treasurer, in place of Bayard Butler, elected Treasurer; Benjamin F. Crawford, Cashier. Mr. Butler has been in the service of the company for nearly twenty years, and is well known to all having business to transact in the Treasurer's office. Mr. Taylor and Mr. Crawford are new appointments. Mr. Taylor has been for some time past Secretary and Treasurer of the East Broad Top Railroad Company, and Mr. Crawford has been paying teller in the Western National Bank.

—The first board of directors of the new Timber Brook Railroad Company is as follows: W. J. Harlan, Edward A. Wild, Green Lake, N. J.; Cleveland Wilson, Trenton, N. J.; Alfred Lawton, Alfred W. Lawton, Elizabeth, N. J.; Samuel H. Whitney, Newark, N. J.; H. M. James, Jersey City, N. J.; Walter Lawton, Joseph G. Moody, Charles Rammelsburg, Frank T. Wendell, John B. Yale, Julian L. Yale, New York.

—Mr. Edgar Hill has been appointed General Freight Agent of the Louisville, Cincinnati & Lexington Railroad, in place of E. P. Wilson, resigned.

—Messrs. Bullock, Beard and Cobb having declined to serve as members of the Hoosac Tunnel Commission, Governor Talbot, of Massachusetts, has appointed in their places Senator Washburn, Charles Francis Adams, Jr., and George A. Richardson. The Commission is now composed of the following gentlemen: Hon. W. D. Washburn, Worcester; Stephen M. Crosby, Northampton; Paul A. Chadbourne, Williamstown; Charles Francis Adams, Jr., George A. Richardson, Boston.

—At a meeting of the board of managers of the Philadelphia & Erie Railroad Company, July 18, Robert Thompson was elected President of the company in place of W. Hasell Wilson, who resigned on account of the additional duties devolving upon him as Consulting Engineer of the Pennsylvania Railroad under the new organization.

At the annual meeting of the Mexican Railway Company in London, June 30, the retiring directors, Messrs. W. Barron, G. W. Campbell and R. W. Crawford (the latter chairman of the board) were re-elected, and Mr. David Ferguson, of the city of Mexico, was chosen a new director. Mr. Ferguson is, we believe, connected with the banking house of Barron, Forbes & Co.

—It is reported that Mr. George C. Kimball, formerly Superintendent of the Flint & Pere Marquette road, has been offered the position of General Superintendent of the Chicago & Michigan Lake Shore Railroad.

—At the annual meeting of the Central Pacific Railroad Company in San Francisco, Cal., July 14, the following directors were elected: Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., Robert Robinson, C. H. Cummings and Charles Crocker. The only change from last year is the substitution of Mr. Crocker, the first Superintendent and one of the main promoters of the road, for William E. Brown.

—At the annual meeting of the Terminal Railroad Company in San Francisco, July 15, the following directors were chosen: Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., Robert Robinson, E. I. Robinson, Charles Crocker. The road is controlled by the Central Pacific.

—At the annual meeting of the Northern Railroad Company in San Francisco, July 15, the following directors were chosen: Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., C. H. Cummings.

—The general officers of the Milwaukee, Lake Shore & Western Railroad are as follows: President, F. W. Rhinelander; Treasurer, Lawrence Wells; Secretary, Charles Luling; General Superintendent, H. G. H. Reed; Assistant Superintendent, J. Donohue; General Freight and Passenger Agent, H. F. Whitcomb; Auditor, J. S. Griffith; Cashier and Train Dispatcher, A. F. Graham. The Treasurer has his office in New York City, the Assistant Superintendent and Secretary in Manitowoc, Wis., and all the other offices are now in Milwaukee.

—At the annual meeting of the San Pablo & Tulare Railroad Company in San Francisco, July 15, the following directors were elected: Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., C. H. Cummings, who are also Central Pacific officers.

—Mr. Milton Sessions has been appointed Master Car and Bridge Builder of the Keokuk & Des Moines Railway, in place of W. E. Smith, resigned. Mr. Sessions was for a long time Master Car Builder of the Vermont Central, which road he left a little over a year ago to become General Manager of the Taunton Car Company. Mr. Samuel W. Wakefield has been appointed Master Mechanic of the road in place of James Lamb, resigned.

—Mr. H. H. Courtright has been appointed General Freight Agent of the Hannibal & St. Joseph Railroad, in place of J. F. Goddard, who has resigned.

—Mr. E. B. Thomas, Receiver of the Lake Shore & Tuscarawas Valley Railroad, has made the following appointments: W. W. Card, Superintendent and Chief Engineer; Wm. H. Grout, Auditor and General Freight Agent; R. L. Chamberlain, Receiver's Cashier; W. L. Holden, General Passenger and Ticket Agent; Charles Fellows, Master Mechanic; James Reynolds, Road Master. The only new appointment is that of the Receiver's Cashier.

—Mr. J. E. Wratten, late of San Francisco, has been appointed Assistant Superintendent of the Virginia & Truckee Railroad.

—At the annual meeting of the Stockton & Visalia Railroad Company in San Francisco, July 15, the following directors were elected: Leland Stanford, C. P. Huntington, Mark Hopkins, R. H. Miller, Jr., Robert Robinson, C. H. Cummings, N. T. Smith. The road is controlled by the Central Pacific.

At the annual meeting of the Stockton & Copperopolis Railroad Company in San Francisco, July 15, the following directors were chosen: Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., Robert Robinson, C. H. Cummings, N. T. Smith. The road is worked by the Central Pacific, which controls it.

—At the annual meeting of the Sacramento Valley Railroad Company in San Francisco, July 15, the following directors were chosen, Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., C. H. Cummings. The road is controlled by the Central Pacific.

—The stockholders of the California Pacific Railroad Company met in San Francisco, Cal., July 15, and elected the following directors: George E. Gray, B. P. Hammond, Moses Hopkins, Jo. B. Gunn, C. J. Robinson, N. T. Smith, J. L. Willcutt.

—The stockholders of the Rochester, Nunda & Pennsylvania Railroad Company have elected the following directors for the ensuing year: Geo. W. Aldridge, Henry C. Wisner, Rochester, N. Y.; B. F. Dow, Geo. W. Root, York, N. Y.; A. Lockhart, D. P. Richardson, Angelica, N. Y.; J. C. Wicker, Leicester, N. Y.; C. L. Bingham, Mount Morris, N. Y.; A. W. Winn, Friendship, N. Y.; James Hill, Syracuse, N. Y.; Samuel Swain, Geo. M. Osgoodby, F. D. Lake, Nunda, N. Y.

TRAFFIC AND EARNINGS.

—The earnings and expenses of the Pennsylvania Railroad Company's lines for the six months ending June 30 were as follows, the report covering all the lines east of Pittsburgh:

	1874.	1873.	Increase.	Decrease.	P. C.
Earnings	$18,013,866	$19,592,754	..	$1,578,888	8.06
Expenses	11,809,073	14,768,393	.....	2,959,320	20.04
Net earn'gs.	$6,204,793	$4,824,361	$1,380,432	.....	28.62

The expenses were 65.55 per cent. of earnings in 1874, and 75.38 per cent. in 1873.

—The earnings of the Philadelphia & Erie Railroad for the month of June were as follows:

	1874.	1873.	Increase.	Decrease.	P. C.
Earnings	$312,032	$354,396	.....	$ 42,364	12
Expenses	234,708	387,718	.....	153,010	39½
Net earnings	$77,324	.....	$110,646	.....	....
Loss	.....	$33,322	.....	.....	....

The expenses were 75.22 per cent. of earnings in 1874, and 109.40 per cent. in 1873.

—The earnings of the Denver & Rio Grande Railway (main line) for the second week in July were: 1874, $9,550; 1873, $7,656; increase, $1,894, or 24¾ per cent.

—During the month of June the Utah Central Railroad carried 8,433 tons of freight, including 3,032 tons of coal and coke and 636 tons of lumber.

—During the month of June the Utah Southern Railroad carried 6,338 tons of freight, including 1,539 tons of coal and coke, and 1,904 tons of ore and bullion.

—The earnings of the Georgia Railroad for the year ending March 31, 1874, were as follows:

Earnings ($6,894 per mile)	$1,571,785 12
Expenses (66.50 per cent.)	1,045,206 73
Net earnings ($2,310 per mile)	$526,578 29

—The earnings of the Macon & Augusta Railroad for the year ending March 31, 1874, were as follows:

Earnings ($1,556 per mile)	$121,374 51
Expenses (82.72 per cent.)	100,405 69
Net earnings ($269 per mile)	$20,968 82

—The receipts of the French railroads during the first three months of 1874 were $34,974,637, which is less by $1,636,929 than the receipts for the corresponding period in 1873, a decrease of 4⅘ per cent.

—The earnings of the Grand Trunk Railway for the week ending July 4 were: 1874, £41,700; 1873, £36,300; increase, £5,400, or 14⅞ per cent.

—The earnings of the Holyoke & Westfield Railroad for the year ending March 31 were $34,551, or $3,455 per mile. The expenses and interest on bonds were $28,000, leaving $6,551 to divide between the company and the lessees of the road, the New Haven & Northampton Company. For the three months ending June 30 the earnings were $9,344, or $934 per mile.

—The earnings of the Chicago, Milwaukee & St. Paul Railway for the third week in July were: 1874, $153,000; 1873, $167,470; decrease, $14,470, or 8⅝ per cent.

—The earnings of the Chicago, Milwaukee & St. Paul Railway for the second week in July were: 1874, $173,200; 1873, $187,450; decrease, $14,250, or 7⅝ per cent.

—The earnings of the Toledo, Wabash & Western Railway for the second week in July were: 1874, $78,717; 1873, $92,933; decrease, $14,216, or 15⅓ per cent.

—The earnings of the Michigan Central Railroad for the second week in July were: 1874, $111,633; 1873, $114,047; decrease, $2,414, or 2⅛ per cent.

—The earnings of the St. Louis, Iron Mountain & Southern Railroad for the second week in July were: 1874, $56,962; 1873, $49,188; increase, $7,774, or 15¾ per cent.

—The stock receipts at the Baltimore yards for the six months ending June 30, as compared with the same time last year, were as follows:

	Cattle.	Sheep.	Hogs.
1874	35,475	72,246	187,535
1873	33,530	64,752	203,272

Showing an increase of 1,945 cattle and 7,494 sheep, and a decrease of 15,737 hogs.

—The earnings of the Chesapeake & Ohio Canal for June were: 1874, $75,147.60; 1873, $68,340.05; increase, $6,807.55, or 10 per cent. The coal tonnage for the month was: 1874, 118,175; 1873, 111,914; increase, 6,261 tons, or 5⅗ per cent.

—Of the flour and grain shipments eastward from the Western lake ports for the week ending July 18, 40 per cent of the flour, about 7 per cent. of the wheat, less than 3 per cent. of the corn, and 64 per cent. of the oats went by rail, the lake and canal rates meanwhile being the lowest since the war.

—The earnings of the Great Western Railway of Canada for the week ending July 10 were: 1874, £19,218; 1873, £23,876; decrease, £4,258, or 17¾ per cent.

—The earnings of the Grand Trunk Railway for the week ending July 11 were: 1874, £39,800; 1873, £37,700; increase, £2,100, or 5⅗ per cent.

—The earnings of the Indianapolis, Bloomington & Western Railway for the second week in July were: 1874, $26,607; 1873, $25,659; increase, $948, or 3⅗ per cent.

PERSONAL.

—Mr. Ansel Tucker, the oldest railroad conductor in New England, and probably in the United States, died at Portland, Me., July 21. Mr. Tucker has been on the Boston & Maine road almost from its first opening, having been conductor on that road for 34 years. His oldest son, Mr. Payson Tucker, is General Agent for the Boston & Maine at Portland.

THE SCRAP HEAP.

British Rail Exports.

The total exports of railroad iron from Great Britain for the six months ending with June were 427,267 tons in 1874 against 347,757 in 1873, the increase being 79,510 tons, or 23 per cent. The exports to the United States were 64,969 tons in 1874 against 120,468 tons in 1873, showing a decrease of 55,499 tons, or 46 per cent. The imports this year were about sufficient to lay about 800 miles of track.

For the month of June the total exports of railroad iron from Great Britain were 92,174 tons in 1874 against 72,962 in 1873. The exports to the United States were 12,524 this year and 18,016 last, showing a decrease of 30 per cent. Our June imports were something more than the average for the half-year, however, and next to Russia we were the largest customer for English rails, as we were for the half-year.

Railroad Manufactures.

The Jackson & Sharp Company, at Wilmington, Del., has been building some narrow-gauge cars for the Chester & Lenoir Railroad.

The National locomotive works of Dawson & Bailey, at Connellsville, Pa., are being enlarged by the building of a large blacksmith shop, which will contain a heavy steam hammer besides the usual forges.

Messrs. Clarke, Reeves & Co., of Phœnixville, Pa., have recently received orders for building two spans, each 138 feet long, of double-track through bridges for the Philadelphia, Wilmington & Baltimore Railroad, also a span, 255 feet long, of single-track through bridge for the Havre de Grace bridge over the Susquehanna, on the same road.

The car shops at Jacksonville, Ill., are closed for the present, for want of orders.

The Portland Company, at Portland, Me., is building 15 engines for the Grand Trunk Railway, that number out of the 50 recently let to the Rhode Island Locomotive Works having been transferred to Portland.

OLD AND NEW ROADS.

Canada Southern.

A meeting of the English bondholders was held in London on the 8th of July to consult concerning the company's failure to pay the coupons. Mr. H. Labouchere, Chairman of the bank that brought out the bonds, thought that when the road's connection is complete it will be able earn much more than its interest charges, but said that "they had certainly to complain that not until one day before the date on which the interest became due did they receive information to the effect that that interest would not be paid." A committee, consisting of Alderman Sidney, Greenwood, C. F. Denny, Wake and Harris, was appointed to inquire into matters and report.

Burlington, Cedar Rapids & Minnesota.

Clews, Habicht & Co. advertise in London that they will pay the coupon due August 1 on the Milwaukee Division bonds negotiated by them.

Missouri, Kansas & Texas.

Mr. Levi Parsons, the President, advertises in London that the company is prepared to receive bonds to be stamped in accordance with an agreement made April 28 last between the company and the trustees of the bondholders.

The agreement provides that:

1st. The coupons of 1st February and 1st August, 1874, equal on $1,000 to $70, are to be converted into and exchanged for $98.87 of 8 per cent. preferred stock.

2d. The coupons of 1st February and 1st August, 1875, and 1st February, 1876, will, when due, be provided for as follows: One-half of each coupon will be paid in gold and the remaining half will be converted into 8 per cent. preferred stock at the price of gold on the day that each coupon falls due.

The preferred stock will carry interest at 8 per cent. in currency during the period of arrangement.

Rockford, Rock Island & St. Louis.

The decision of the United States Circuit Court in Chicago refusing to foreclose the mortgage was based solely on the fact that the interest must have been in default six months before the foreclosure could be had, that the defaults previous to last February had been condoned by the arrangement for scaling down the bonds made in July, 1872, while when the bill was filed, June 11, the February coupons had not been due six months. As the six months expire August 1, there seems to be no obstacle to a successful issue of a suit brought on that date.

The Court has granted the plaintiff (the Union Trust Company of New York) leave to amend the bill and also to file a supplemental bill at any time within 30 days. The supplemental bill will be free from the defects which caused the original bill to be dismissed.

Grand Rapids, Greenville & Alpena.

A note of this company for $9,105.44, dated Jan. 12, 1874, and due 60 days after date, indorsed by Moses R. Jefferds, the President of the company, and by Wm. H. Bradford, and protested for non-payment, was sold at auction in New York, July 23, for $45.

A German's Opinion on American Railroads.

Mr. H. Osterberg, publisher of the *German-American Economist* of Frankfort, Germany, who visited this country recently as the agent of the holders of the Rockford, Rock Island & St. Louis bonds, writes as follows in his paper of July 4:

"So far as railroad transportation is concerned, it is better managed than in any other country in the world. The punctuality with which the trains arrive and depart and with which connections are made must raise the wonder of every European. The substructure of the roads is considerably improved, every imaginable attention is paid to the comfort of the traveling public, the tariffs are considerably cheaper than in Europe, even including Belgium, and the number of accidents has been considerably lessened."

United States Contracts.

Major William P. Craighill, Corps of Engineers, will receive proposals at his office, Bank Building, Fayette, near Charles street, Baltimore, down to July 31, at noon, for dredging in the Appomattox River, Va.; and until noon of August 10 for dredging in the Cape Fear River, N. C.

Capt. S. M. Mansfield, Corps of Engineers, will receive proposals at his office, Moffat's Block, Detroit, until noon on August 12, for the following harbor improvements on the Michigan shore of Lake Michigan:

Frankfort Harbor, one crib; Manistee Harbor, 495 feet of pile revetment; White River Harbor, one crib; Muskegan Harbor, one crib and 135 feet of revetment: Grand Haven Harbor, six cribs and 500 feet of revetment; Black Lake Harbor, three or four cribs; Saugatuck Harbor, 400 feet of revetment, dredging about 7,600 cubic yards of sand and about 600 cubic yards of old slab pier; South Haven Harbor, 300 feet of

revetment and dredging about 13,575 cubic yards of sand and slabs.

Major Godfrey Weitzel, Corps of Engineers, will receive proposals at his office, No. 85 Washington avenue, Detroit, until 3 P. M. on August 15, for the following river and harbor improvements:

Crib work in continuation of that now in progress for the harbor of refuge at Sand Beach, Mich. Dredging in continuation of the present improvement at Cheboygan Harbor, Lake Huron, Mich., and at the mouth of Black River, in the St. Clair River, at Port Huron. Pile revetment and dredging in Saginaw River, Mich.

Major G. K. Warren, Corps of Engineers, will receive proposals at his office, Newport, R. I., until 10 A. M. of August 22, for dredging at the following places: Wareham Harbor and Taunton River, Mass.; Pawtucket River and Newport Harbor, R. I.; Pawcatuck Harbor, R. I. and Conn. Also for rip-rap granite at the following places: Breakwater, Hyannis, Mass.; breakwater, Block Island, R. I.; jetty at the mouth of the Connecticut. Also for removing boulders in Fall River Harbor, Mass.

Major J. W. Barlow, Corps of Engineers, will receive proposals at his office in New London, Conn., until 10 A. M. of August 26, for dredging at the following places in Connecticut: Stonington Harbor, Bridgeport Harbor, Norwalk River.

Lieut.-Col. Quincy A. Gilmore, Corps of Engineers, will receive proposals at his office, Army Building, New York, until noon of August 13, for dredging at different places in the Savannah River, the total amount being from 110,000 to 133,000 cubic yards, to be given out in one or more contracts.

Springfield Railroad Crossings.

The question as to crossing certain streets of Springfield, Mass., at grade by the railroads entering that city has been settled by the city adopting the plan suggested by the companies. Chestnut street is to be carried under the track, the street being lowered 12 and the track raised 2½ feet. The grade crossing at Main street is to remain, street and track being raised four feet. The city is to be at liberty whenever it is thought necessary to carry Main street under the track. The expense of the changes, estimated at $40,000, will be paid by the city. The companies promise to build a new depot on or near the site of the present one.

The Convention of Northwestern Railroad Commissioners.

The President of the Illinois Board of Railroad Commissioners has issued a call for a meeting of the Railroad Commissioners of all the Northwestern States, to be held in Dubuque, Ia., August 12. The meeting is for conference, and of course will be voluntary and informal.

Hoosac Tunnel Line.

Mayor S. C. Cobb and Mr. A. W. Beard, of Boston, have declined to serve on the Hoosac Tunnel Commission, and the Governor has filled the vacancies by the appointment of ex-Governor and Senator W. D. Washburn, of Worcester, Charles Francis Adams, Jr., and George A. Richardson, of Boston. The commission as it stands is a pretty strong one, and there is no doubt that its conclusions will carry much weight with them. Mr. Adams will doubtless be the most active member and he has heretofore strongly favored a consolidated line to be owned and worked directly by the State.

The Springfield (Mass.) *Republican* says: "Since the letting of daylight through the tunnel, an unexpected trouble has been developed by the frequent falling of portions of its rocky roof, induced by the warmer temperature of the air admitted to the tunnel by its opening, thus making passage through it exceedingly dangerous. This, it is thought, will necessitate much additional expensive arching."

The road-bed through the tunnel is now all ready for the rails.

Timber Brook.

Articles of association under the general railroad law have been filed by the Timber Brook Railroad Company. The road to be built is about 12 miles long, from the Morris & Essex at Port Oram, N. J., north by east to a junction with the Green Pond Railroad near the Timber Brook Iron Company's mines in the town of Rockaway, Morris County. The road will be used mainly for the transportation of iron ore and coal.

Erie.

The Attorney General of New York has decided to grant the application of John C. Angell and to bring suit against this company in the name of the State. The grounds for the suit are alleged illegal action of the directors in purchasing coal lands with a view to mining coal; in purchasing the capital stock of the Buffalo, New York & Erie Company; in leasing the Atlantic & Great Western road; and in the declaration of dividends. The Attorney General says that the suit will be conducted so as to disturb as little as possible the business of the company. He does not attribute corrupt action to the directors, but thinks that they have exceeded their powers and that there are grave questions as to the limitations of corporate rights involved, which should be settled by the Courts.

Burlington & Lamoille.

The city of Burlington, Vt., has voted to issue bonds to the amount of $160,000 in aid of this proposed road which is to connect Burlington with the Portland & Ogdensburg at Cambridge. It will be 32 miles long.

Springfield & Longmeadow.

The city of Springfield, Mass., has voted to subscribe $150,000 to the stock of this company. This sum, with $50,000 private subscriptions, said to be promised, will be sufficient to build the road, which will be seven miles long, from Springfield south by east to the Connecticut line, where it will connect with the Connecticut Central road.

Connecticut Central.

This company has secured $155,000 town and $138,000 private subscriptions, and arrangements are being made to begin work this fall and have the road completed early next summer. The balance of the money needed is to be raised by issuing bonds. The road will extend from the Massachusetts State line south 19 miles to a junction with the Hartford, Providence & Fishkill in East Hartford, with a branch 6½ miles long to Rockville. It will be extended from the State line north to Springfield, Mass., by the Springfield and Longmeadow road.

Cleveland, Mount Vernon & Delaware.

Amsterdam dates of July 2 say: "A company which has always been considered first-class has also resolved not to pay the July coupon. This is the Cleveland, Mount Vernon & Delaware Railroad Company." The road, now called the Cleveland, Mount Vernon & Columbus, is 145 miles long, from a junction with the Cleveland & Pittsburgh at Hudson, O., southwestward to Columbus. By the report for the year ending with June 30, 1873, it had outstanding $1,900,000 of first mortgage, and $1,000,000 of second-mortgage 7 per cent. bonds, and its net earnings were $129,820, while the interest and rental of a leased line left a deficit of $75,766.

Stockton & Copperopolis.

Amsterdam advices say that the July interest on this company's bonds was not paid. The line is officered from the Central Pacific's directors and officers, worked by that company and generally considered a part of its property, which, however, it is not legally. The line extends from Stockton, Cal., eastward 30 miles to Milton, 15 miles of which, from Stockton to Peters, forms the northern outlet of the Stockton & Visalia. A report made to the Secretary of State of California and published in the "American Railroad Manual" (the line is not mentioned in Poor) gives the capital stock as $48,000, cost of construction $607,942; earnings, $24,203 or $52,790 less than the expenses; but no date for this report is given; but the volume published last June gives different figures from that published in August of last year. The latter showed a deficit of about $50,000. Neither gives any account of the amount of the bonded debt.

German financial journals give the amount of the funded debt as $1,000,000, bearing 8 per cent. interest, which would make a yearly interest charge of $2,667 per mile.

Minnesota & Northwestern.

Work has actually been resumed on the line from Wells, Minn., to Mankato. About 250 men are at work finishing up the grading, and track laying has been commenced.

Greenville & French Broad.

An assessment of 5 per cent. on the stock has been called in, and the work is to be commenced. The road is to run from Hendersonville, N. C., a little west of north, down the valley of the French Broad River to the East Tennessee, Virginia & Georgia near Greenville, Tenn.

Atchison Bridge.

The necessary material and machinery for the foundations of the piers of the bridge over the Missouri at Atchison, Kan., have been received and work will be commenced shortly.

Allentown.

The Pottsville (Pa.) *Miner's Journal* says that work is to be begun soon on this road, from Kutztown, Pa., to a connection with the Berks County road. Most of the road was graded in 1856, but it was subsequently abandoned. A short section of the grade was used by the Reading Company in building its branch from the East Pennsylvania at Topton to Kutztown.

Rutland.

At an adjourned meeting of the stockholders of this company in Rutland, Vt., July 28, the proposition from the Central Vermont Company for a modification of the lease and reduction of the rental were unanimously adopted. A resolution was also adopted approving the action of the directors in purchasing an interest in the Central Vermont Company.

Iowa Pacific.

The London *Economist* of July 11 has the advertisement of Blythe & Co. inviting subscriptions to an issue of £570,000 of firs-mortgage 7 per cent. gold bonds secured by the first 138 miles of this proposed road at 87½. The Chicago, Burlington & Quincy, the Chicago, Clinton & Dubuque and the Chicago, Dubuque & Minnesota companies have agreed to invest 25 per cent. of their gross receipts from traffic delivered to or received from this road at par. The Chicago, Dubuque & Minnesota will also give it a rebate of 20 per cent. on gross receipts from all traffic received from the Iowa Pacific, of which it will be the sole eastern outlet as far as Dubuque on the south and La Crescent on the north.

The advertisement describes the road as follows:

It "intersects the Chicago, Dubuque & Minnesota Railroad northwest boundary of Fayette County, Iowa, and runs westerly through the thriving cities and towns of Sumner, Waverly, Clarksville, Hampton, Belmond, Clarion and Fort Dodge, traversing the rich and rapidly growing counties of Brewer, Butler, Franklin, Wright and Webster, forming the first section of 138 miles in length. The second section, 109 miles in length, extends from Fort Dodge through the towns of Calhoun, Sac, Ida and Onawa, in the rich and fertile counties of Calhoun, Sac, Ida and Monona, the whole route opening up the route from Minnesota, Wisconsin and Northern Iowa to the Union Pacific Railroad."

An estimate is given that the earnings of the first section will be $1,625,000, or $11,780 per mile, and that one-half of this will be net.

Junction & Breakwater.

Messrs. Reed, Sheaff and Baumgardner, who hold nearly all the stock of this company, have sold it to McCready & Ball, managers of the Old Dominion Steamship Company, whose vessels run from New York to Norfolk, Va., and Richmond. The price paid is not made public, but is reported to be $90,000.

The road is 45 miles long, from the Delaware Railroad at Harrington by a very circuitous route to Lewes at the Delaware Breakwater. It is reported that the new owners desire a connection with the railroads of the lower Peninsula, which could be easily and cheaply done by extending the Frankford & Breakwater road, now under construction, southward to a connection with the Wicomico & Pocomoke.

Pittsburgh, Wheeling & Kentucky.

The people of Ohio County, West Va., have voted against subscribing any more money to this road and have also voted to authorize the county authorities to transfer the stock now held by the county to any one who is willing to finish the road.

Detroit & Milwaukee.

The Detroit *Tribune* of July 21, says: "It is quite well known in financial circles that the Detroit & Milwaukee Railroad bondholders have not been paid any interest for some time. Some time since a meeting of the creditors was called, but nothing definite was done. Yesterday afternoon, however, another meeting was held at which it was unanimously decided to institute proceedings to foreclose the mortgages given by the company and to make an application for the appointment of a receiver. A large number of the creditors of the road reside in England and Canada, but we are informed that a majority of them are Americans, therefore an effort will be made to secure the possession of an American to fill this position. The total bonded debt of the road is about five and a half millions, and of this sum nearly a half million is owned by Detroit capitalists. Precisely what legal steps will be taken we are not advised but they will be developed in a few days."

Norwich & Worcester.

The trouble with the New London Northern as to the use of the track from Norwich to New London has been settled. The trains of this road and the steamboats of the Norwich & New York Transportation Company will hereafter run to New London, as formerly, instead of going to Allyn's Point, as they have done for some months past.

Missisquoi & Clyde Rivers.

The connection between this road and the Missisquoi Railroad at Richford, Vt., has been completed. Through cars will be run from Newport, Vt., to New York, by way of St. Albans and the Vermont Central.

New York & Oswego Midland.

It is reported that another arrangement has been made with the Erie, by which through passengers and freight are to be sent from Middletown to New York over that road, instead of the New Jersey Midland.

St. Louis Tunnel Railroad.

Subscriptions were invited in London July 13 for £250,000 of the first-mortgage 9 per cent. bonds of this company, which has constructed a tunnel from the St. Louis and of the great bridge under a part of the city to connect with the railroads, and which, the advertisement says, has cost more than $1,700,000. The principal is redeemable at par Jan. 1, 1888, by an annual sinking fund, the first drawing being payable Jan. 1, 1877. Principal and interest are payable in London at the banking house of J. S. Morgan & Co. The tunnel is 4,100 feet long and has a double track of steel rails. It has a contract for working in connection with the bridge, but levies separate tolls. The Bridge Company guarantees the interest and principal of the tunnel bonds. The road, which is about four-fifths of a mile long, will have to earn net about $112,500 in gold in order to meet the interest.

Fall River.

A company by this name has been organized at New Bedford, Mass., to build a railroad from Braley's Station, eight miles from New Bedford, on the New Bedford Railroad, west to Fall River. The new road will be about eight miles long and will have its terminus at the top of the hill in Fall River, without connecting with the Old Colony road.

The Delaware Peach Traffic.

The first regular peach train from Delaware arrived in Jersey City over the Pennsylvania Railroad, July 28. It consisted of 30 cars. The reports sent from Delaware and the Eastern shore of Maryland by the railroad agents indicate that the peach traffic will show a considerable decrease from last year.

Minnesota Railroad Fares.

The Minnesota Railroad Commissioners have finally agreed upon the schedule of maximum passenger rates which the railroads of that State are to be allowed to charge. It is as follows: five cents per mile, Sioux City & St. Paul, St. Paul & Pacific, First Division, main line, St. Paul & Pacific, Northern Pacific, Minneapolis & St. Louis, Hastings & Dakota, St. Paul, Stillwater & Taylor's Falls, Minneapolis & Duluth; 4½ cents per mile, St. Paul & Sioux City, St. Paul & Pacific, First Division, branch line, Lake Superior & Mississippi, Chicago, Dubuque & Minnesota, West Wisconsin, Southern Minnesota; 4 cents per mile, Milwaukee & St. Paul, River Division and Iowa & Minnesota Division, Winona & St. Peter.

The list published several weeks ago was premature, although partly correct, as the rates had not been finally decided on at that time.

Texas & Pacific.

A correspondent informs us that the California & Texas Construction Company has just completed a handsome bridge over the Trinity River at Dallas, Tex., and has graded seven miles of the road westward, towards Fort Worth. The line to the latter place is being re-located and the whole of the grading will be contracted for as soon as possible. The work is under the charge of Maj. D. W. Washburn, who has succeeded Mr. R. S. Hayes as Engineer in charge of construction and who was formerly Mr. Hayes's assistant on the International.

Houston & Texas Central.

In response to a request from Galveston merchants, this company lately agreed to make rates from all points on its own and connecting lines the same to Galveston as to Houston, provided the Galveston, Houston & Henderson would pro-rate upon such freight. This the Galveston Company has agreed to do, provided the Central will accept the rates made by it on freights from Galveston northward.

Eastern.

This company will redeem, August 1, $750,000 of its 6 per cent. bonds which fall due at that date. These bonds were issued at various dates from 1854 to 1864.

Dallas & Wichita.

Work on this road is progressing, a contract for 10 miles out from Dallas, Tex., having been let. The work is under the charge of Mr. Henry McLoughlin, formerly of Clear Springs, Md.

Boston & Albany.

An unprovoked attack was made on the train from New York which was due in Boston 11:20 p. m., July 27. When it was near Palmer, Mass., a gang of men threw a number of stones through the windows of the passenger cars, injuring two persons seriously. At the next station a party was organized and sent back in search of the gang, who only succeeded in arresting one man.

Chicago & Northwestern.

A Sunday morning newspaper train from Chicago to Milwaukee has been put on this road, which leaves Chicago at 4:15 and reaches Milwaukee at 6:45 a. m., thus making the run of 85 miles in 2½ hours, an average speed of 34 miles an hour. The train is chartered by the Western News Company.

Railroad Taxation in Missouri.

The State board of equalization has completed its valuation of the railroad property in the State of Missouri. The assessed value of the various roads is as follows:

Missouri Pacific	$9,654,423
St. Louis & Iron Mountain	6,206,334
Atlantic & Pacific	6,175,141
Missouri, Kansas & Texas	5,698,950
St. Louis, Kansas City & Northern	6 361,703
Memphis, Carthage & Northwestern	259,850
Missouri, Iowa & Nebraska	871,820
Mississippi Valley & Western	316 125
Chicago & Southwestern	1,739,640
Beaver Branch	29,500
Salem & Southeastern	5,000
St. Louis, Kansas City & Northern Palace Car Company	60,000.
Kansas City, St. Joseph & Council Bluff	2 416,963
St. Louis, Lawrence & Western	159,560
Osage Valley & Southern Kansas	158,600
Missouri River, Fort Scott & Gulf	88,175
Kansas Pacific	32,300
Lexington & St. Louis	666.714
Louisiana & Missouri River	1,234,800
St. Louis & St. Joseph	404,600
Quincy, Missouri & Pacific	484,867
St. Louis, Council Bluffs & Omaha	267,700
Brunswick & Chillicothe	203.800
Burlington & Southwestern	143,710
Booneville & Boone County	114,536
Chicago & Alton	184,342
Hannibal & St. Joseph	9.812,345
Total	$53 462,069

Connecticut Railroad Law.

The Connecticut Senate has passed an amendment to the general railroad law, which provides that no company shall issue bonds until the road-bed is finished and ready for the iron. The issue then is limited to $10,000 per mile for single track or $20,000 per mile for double track of iron, or $14,000 and $28,000 per mile if steel rails are used. After the road is completed more bonds can be issued, provided the company can prove to the Railroad Commissioners that the road is earning and likely to continue to earn money enough to pay the interest on them. The amendment also removes the restrictions on bridging navigable rivers now in the general law, providing such bridges are built in accordance with the orders of the Railroad Commissioners.

Louisville & Nashville.

The Nashville (Tenn.) *Union and American* of July 11 says: "For several months past, the Louisville, Nashville & Great Southern, and the Nashville, Chattanooga & St. Louis railroad companies, backed by several Nashville capitalists, have been quietly maturing plans for the erection of an immense cotton warehouse and shed[illegible] Northwestern railway track, about half way betwe[illegible] school-house and the Fair Grounds, with a storag[illegible] 50,000 bales.

"An agreement has [illegible] and signed by the Nash-

ville, Chattanooga & St. Louis Railway Company, by which that company binds itself to receive no cotton at points farther south and destined for Nashville, except with the understanding that it be delivered at the proposed warehouse. This agreement was sent, last week, to Colonel Fink, at Louisville, to get the endorsement of the Louisville, Nashville & Great Southern Railway Company. Colonel Fink made some slight amendments to the agreement and returned it to Nashville, with the understanding that his road would enter into the combination if those slight amendments were agreed to. This was done at once, and the document was again forwarded to Louisville last Monday, and has not yet been returned to Nashville."

This proposed action has caused much excitement among the Nashville cotton factors.

Union Pacific.

An Omaha dispatch says: "Arrangements have been completed with Eastern capitalists by which large stock yards are to be immediately erected at this point. Surveys have just been completed by the Union Pacific Company for a forty-stall engine house on the grounds near the west end of the bridge, to be erected this year.'

The company is offe ing to exchange second-mortgage 8 per cent. bonds, known as sinking-fund bonds, in exchange for the outstanding income bonds at the rate of six of the new bonds for five income bonds. One per cent. of the new bonds will be retired annually by the sinking fund. They will be in fact a third lien on the road only, as they do nottake precedence of the Government lien.

Sioux City & Kearney.

Surveys are to be made of a line from Sioux City, Ia., southwest through Nebraska to the Union Pacific at Kearney.

Yaquima & Willamette Valley.

It is proposed to build a narrow-gauge road from Yaquima Bay, on the coast of Oregon, eastward through the Coast Range Mountains to the most convenient point in the Willamette Valley. The road would be not less than 75 miles long, and it is proposed to build it mainly by county subscriptions.

Joliet Iron & Steel Company.

A meeting of creditors was held at Joliet, Ill., July 20. After some discussion it was unanimously resolved to accept the company's proposition to exchange preferred stock for all claims of indebtedness. The President of the Company stated that most of the heavy Eastern creditors had accepted the proposition and that the steel mill would probably be at work early in September. Hon. W. S. Brooks, George H. Jones and George Woodruff were appointed a committee to collect the claims and see to their exchange for the preferred stock.

New London Northern.

There is talk of building a branch line from a point on this road near Stafford Springs, Conn., northwest to Springfield, Mass. It is understood that if the Springfield people will build the road, the railroad company is willing to equip and operate it, paying as rental a fair interest on the cost.

Lee & Hudson.

This company intends to raise the balance of the money needed to build the road by issuing $150,000 of bonds, $200,000 having been obtained from town and individual subscriptions. The bonds are to be endorsed by the Boston & Albany Company, the necessary legislative authority having been obtained.

North Wisconsin.

This company has located the line north from New Richmond over 25 miles to a point 28 miles due east from Taylor Falls. The location is about three miles east of where the old survey struck the south side of Polk County, and continues east of it to Turtle Lakes. Seven miles of the road have been graded. Mr. J. H. Fisher, of Grand Rapids, contractor, has commenced work at a point 13 miles from New Richmond. He has the contract for 15 miles, which takes the work to 27 miles northeast of New Richmond.

Missouri, Iowa & Nebraska.

This company proposes, if the city of Keokuk, Ia., will give right of way, depot grounds and $80,000, to extend its road from the present river terminus at Alexandria, Mo., to Keokuk, about six miles. It will agree to build a bridge over the Des Moines River, which shall be a highway as well as a railroad bridge, the highway portion to be under the control of the city.

Tennessee Railroad Taxation.

Most of the railroads in Tennessee were exempted by their charters from taxation for a term of years. On some this exemption expires this year and on nearly all next year. In several counties a disposition is already shown to tax them pretty liberally. Franklin County, for instance, has assessed that portion of the Nashville, Chattanooga & St. Louis Railroad within the county limits at from $25,000 to $40,000 per mile, and the Tennessee Coal & Railroad Company's branch to Tracy City at $16,000 per mile.

New River.

At a meeting of this company held recently it was resolved to push forward the surveys of the line. Committees were also appointed to secure right of way and to procure county subscriptions. The road is to run from the Atlantic, Mississippi & Ohio at New River Bridge north by west through the New River Valley to the Chesapeake & Ohio at the mouth of Greenbrier. It will be about 60 miles long.

Boston & Lowell.

The New Hampshire Legislature has passed the bill authorizing the consolidation in one corporation of this company and the Nashua & Lowell. There has long been a practical consolidation of the two companies, but they have lacked the legislative authority for a complete union. A consolidation now will make no change in the relations of the roads, but will serve to simplify the management of the property.

Rochester, Nunda & Pennsylvania.

It is stated that this company has succeeded in negotiating its bonds conditionally in London. The contract requires the bonds to be placed with a trustee, and no money is to be advanced until the company completes the section from Mt. Morris, N. Y., south to the Buffalo Division of the Erie road at Ross'. When this is done an installment of $300,000 is to be paid and other installments as the work progresses. The required work the company expected to be able to do with the last payment of $50,000 from the city of Rochester. The veto of the ordinance appropriating the $50,000 by the Mayor of Rochester has prevented the company from obtaining it, and places it in a somewhat embarrassing position.

Virginia & Truckee.

The old part of the road, from Virginia, Nev., to Carson, 21 miles, is to be relaid with steel, and the first lot of new steel rails has arrived at Reno. The traffic on this section is very heavy.

Telegraph Lines on Railroad Property.

In the suit of the Atlantic & Pacific Telegraph Company against the Chicago, Rock Island & Pacific Railroad Company, a decision was given by the United States Circuit Court in Chicago, July 21. The telegraph company claimed the right to put up its posts and construct its lines along the line of the railroad on the ground that it was a post road and came under the provisions of the law of July 24, 1866, providing for the erection of telegraph lines. The railroad company refused to allow the construction of the line, when the telegraph company applied for an injunction. The Court refuses the injunction and holds that the act of 1866 refers only to railroads owned or controlled by the Government, and does not include railroads simply designated as post roads and over which the Government exercises no control, but simply contracts for the carriage of the mails. Further, Congress has no power to take or authorize others to take the private property of a railroad corporation for the purpose of erecting and maintaining a telegraph line, without compensation for the franchise so sought to be granted.

Panama.

It is understood that negotiations are going on, the object of which is to secure the closest possible union between this company and the Pacific Mail Steamship Company. The interests of the two are in great measure identical, and a close business union would seem to be almost indispensable to both.

Central Branch, Union Pacific.

Samuel L. Treadwell, one of the contractors for the construction of this road, has a suit now pending in New York to compel an accounting by his partners and the company as to the profits of the contract. He asks for an injunction and the appointment of a receiver pending the suit.

Chippewa Valley & Red Cedar.

This company was fully organized at a meeting held at Eau Claire, Wis., July 9. It has asked for a subscription of $100,000 from Eau Claire County, and a special election on the question is to be held August 18.

Utica, Ithaca & Elmira.

The directors have, it is stated, accepted a proposition to furnish funds to construct the road from the present terminus to the foot of the hill at Ithaca, N. Y. It is expected the road will be in running order from Ithaca to Spencer in a few days. The track of the Geneva, Ithaca & Athens is now used between those two places.

Michigan & Ohio.

Ground was broken for this road at Grand Haven, Mich., July 21. Howland, White & Co., are the contractors. The road is intended to run from Grand Haven southeast to Portsmouth, O., 400 miles.

The Illinois Tax on Capital Stock.

The United States Circuit Court at Springfield, Ill., has issued a temporary injunction restraining county collectors from collecting taxes of 1873 from the St. Louis, Vandalia & Terre Haute Railroad Company. The case is to be argued August 2. The Cleveland, Columbus, Cincinnati & Indianapolis Railroad Company, as a stockholder of the Indianaplis and St. Louis Company, has applied to the United States Court for an injunction preventing the last-named company from paying, and the county collectors along the line from collecting the taxes assessed on the capital stock. It appears that the other taxes against the company have been paid. The temporary injunction was granted, and this case also will be argued August 2.

Baltimore, Pittsburgh & Chicago.

This company, it is stated, has at last secured the right of way for its line into Chicago. Its track will connect with the Illinois Central at Seventieth street, 10 miles from the Illinois Central's Chicago depot and three-quarters of a mile north of the point at which the Fort Wayne and the Lake Shore cross.

Columbus, Chicago & Indiana Central.

The United States Circuit Court has given a judgment against this company for about $900,000, principal and interest of a loan made in 1864 by the old Cincinnati & Chicago Air Line Company, and secured by a mortgage on 27 miles of road, from Richmond, Ind., to Newcastle. The Court does not allow that this mortgage gives any lien on the road from Newcastle to Logansport, as was claimed by the plaintiffs, but allows them to file a supplemental bill so as to obtain a decree *in personam* against the parties in possession. The supplemental bills are to be filed against all parties who have used the road under the consolidation and received any income, namely, the Cincinnati & Chicago; Columbus, Chicago & Indiana Central, and the Pittsburgh, Cincinnati & St. Louis companies, to enforce the decree.

Pittsburgh, Cincinnati & St. Louis.

Negotiations are in progress between this company and the Indianapolis, Cincinnati & Lafayette for an arrangement for pooling the earnings on all business between Chicago and Cincinnati. No conclusion has been reached, notwithstanding that it was reported some time since that the arrangement had been made.

Louisville, Paducah & Southwestern.

The lower branch of the Louisville, Ky., city council has passed an ordinance submitting to the people the question of subscribing $1,000,000 to this company.

Lake Ontario Shore.

Under the management of the Rome, Watertown & Ogdensburg Company, work has been resumed on this road. The road bed is being put in order and tracklaying from Ontario, N. Y., westward has been commenced. Work on the bridge over the Genesee at Charlotte will be commenced next week.

Maysville & Lexington.

Bondholders are notified that Mr. H. P. Whittaker has been appointed Commissioner in the suit of Alexander and others against the Maysville & Lexington Railroad Company, Northern Division, and are requested to forward their names, residences and amounts of their holdings to the Hon. George H. Yeaman, counsel for the complainants, No. 294 Broadway, New York, or to the Commissioner, at Covington, Ky., on or before October 15, 1874.

Montpelier & Wells River.

It is stated that the ownership of this road will shortly pass into the hands of three men, J. G. French, now Managing Director, N. C. Munson, of Troy, and Mr. Sawtell, a large stockholder in the Connecticut & Passumpsic Rivers Company.

New Castle & Franklin.

The grading on the upper division is done, the iron for the track has been bought, and tracklaying will begin August 1.

New York Central & Hudson River.

Work on the break at Hazard's Fill, on the Athens Branch, has been suspended, and orders have been given to withdraw the rolling stock from that branch and stop operating it for the present. It is reported that the branch, or at least the southern end of it, will be abandoned.

It is reported that land has been bought near Stuyvesant on the east bank of the Hudson, 10 miles above Athens, where extensive freight depots are to be erected and whence a branch to connect with the Harlem will be built.

Central, of New Jersey.

The Newark & New York Branch of this road runs through part of the city of Newark, N. J., on a high level, crossing the streets on bridges. Some three years ago the Common Council ordered the opening of two new streets under the track of the road. The company opposed the opening, and it has been postponed from time to time until last week, when the Council ordered that the opening should be made at once. The Street Commissioner, with a force of men, accordingly commenced, July 27, to cut through the embankment of the road. The company has thus far taken no action, except to protest and to give notice that the city will be held responsible for any accident or damage that may occur. The question is not as to the right of the city to open the streets, but as to who shall pay for the bridges.

Chicago & Northwestern.

In consequence of the reduction in earnings and the trouble in Wisconsin, this company has been gradually reducing its working force, and about 1,800 men have been discharged within three weeks. Work has been stopped on all improvements, including the new depot in Milwaukee and the car shops near Austin.

Indianapolis, Bloomington & Western.

Holders of first-mortgage extension and second-mortgage bonds of this company are requested to send their names and addresses to W. K. Mead, Assistant Treasurer of the company, whose address is P. O. Box 1,735, New York City.

The Postal Car Question.

The Philadelphia, Wilmington & Baltimore Railroad Company has notified the Post Office Department that the postal cars will not be run over that road after August 1, and that after that date the mail will be conveyed only in an ordinary baggage car. This action, if adhered to, will probably bring the case into the courts at once and lead to a final decision as to the rights of the companies to a reasonable compensation.

Chicago, Rock Island & Pacific.

The new round-house at Rock Island, Ill., is nearly completed. It is of brick, with iron and slate roof, has 42 stalls and is 285 feet in diameter. Work has been commenced on a sand-house, oil-house, coal-shed and smith-shop adjoining the round-house.

Camden, Gloucester & Mount Ephraim.

Arrangements are being made to begin work next month on the extension from Gloucester, N. J., to Mount Ephraim and Blackwoodtown.

The International and the Texas Aid Bonds.

The Austin (Texas) *State Gazette* of a recent date says: "A written demand was made on Governor Coke by Mr. Grow, the President of the International Company, before leaving Austin, to sign bonds for two hundred miles of road—calling for two millions of dollars. This demand was returned with an endorsement, in which the Governor declined to act, on the ground that it was not within his power as Governor to put a judicial interpretation on an act of the Legislature which had referred the arbitration to the Supreme Court."

Monticello & Port Jervis.

On application of some of the creditors the New York Supreme Court has placed this road in the hands of a receiver and has appointed Mr. Charles H. Winfield to that position. The road is 24 miles long, from Port Jervis, N. Y., northward to Monticello, and has been operated under agreement by the Erie.

South Mountain & Boston.

A contract for the grading from Stillwater, N. J., to the crossing of the Sussex road near Branchville has been let to Captain Messemer. The heavy cutting near Blairsville is nearly done.

Illinois & St. Louis Bridge.

The St. Louis *Republican* of July 22 says: "We have the best authority for saying that the reported disagreement between the bridge company and the railroads centering here has no foundation in fact, but that, on the contrary, four of the five railroads represented at the recent conference here have already made contracts with the bridge company for crossing their trains. The object of the conference alluded to was stated by our authority to have been two-fold; first, to decide on what sort of a union depot to build, some being in favor of commencing immediately to erect a permanent building to cost $1,000,000, and others favoring a cheaper and temporary structure; secondly, to come to an agreement by which no road should cross the bridge with its trains until arrangements were completed for all doing so. The railroad men sat with closed doors, and a conference with the bridge men was not even asked for."

The tunnel in the Western approach was to be entirely completed this week, and nearly all the buildings damaged by its construction have been repaired.

Lake Shore & Tuscarawas Valley.

The suit in which a receiver was recently appointed was brought by the Union Trust Company of New York, and is for foreclosure of the first mortgage. The immediate cause is the failure to pay the July coupons. The Receiver, Mr. E. B. Thomas, is Secretary and Treasurer of the Otis Iron & Steel Company, and is said to be a man of capacity and integrity. It is thought that with a little time and care the affairs of the company can be put upon a sound basis.

Cairo & St. Louis.

The grading all along the line from Murphysboro, Ill., to Cairo is expected to be done by the end of August. The iron for 33 miles of track is at Cairo and the ties are all on hand at various points on the line. Col. S. S. Taylor, the President, was in St. Louis last week to make arrangements for the iron for the remaining 25 miles.

Valley, of Virginia.

Orders have been given to reduce the force at work on the contracts of A. Harman and Mason & Co., who have some 34 miles of grading in Augusta and Rockbridge counties. Two reasons are given, one that the work on these sections is much further ahead than that on some other sections, and it is desired to have all the grading done about the same time. The other is that the company does not wish to have the estimates exceed about $60,000 per month at present.

Kansas Midland.

A large quantity of iron has been received at Kansas City, Mo., for this road, and tracklaying will soon be begun on the line from Lawrence, Kan., to Kansas City.

The Railroad Conductors' Life Insurance Association.

The annual convention of this association is to be held in St. Louis, September 2.

Chicago & Alton.

Two conductors of this road were recently arrested for defrauding the company. Their method was to take up the Chicago and St. Louis coupons of through tickets without canceling them, and subsequently to return them to certain ticket offices to be sold. It is said that a large number of these tickets had been thus disposed of.

Central of Iowa.

A meeting of bondholders was to be held in the company's office in New York (No. 20 Broad street), July 30, on a call issued by the President of the company.

Montclair.

An attempt was made to begin running trains over this road, July 20, but the first train was stopped at the high trestle near the junction with the New Jersey Midland at West End. At this point the track had been torn up by a force of workmen employed by Mr. Pratt, former President of the Montclair

Company, present President of the Hudson Connecting Railroad Company, which owns the track at that point, and the party whose right of way injunction has prevented the running of trains for some time past. Mr. Pratt says that, as President of the Hudson Connecting road, he had made an agreement with the Delaware, Lackawanna & Western Company to change the tracks at that point, and further that no arrangement had been made with the Hudson Connecting Company as to running the Montclair trains over its track. Mr. Hewitt, the trustee who holds the Montclair road, claims that Mr. Pratt has no right to make any change in the tracks.

One train a day has been run over the road, transferring passengers at the break. The track was to be relaid and more trains put on this week.

It is probable that the bondholders, who have postponed and delayed the foreclosure sale, know what they are about, but it does seem as if the best policy would be to complete the foreclosure, so that the road might be operated and earn something. At present it is pretty difficult for outsiders to tell who it belongs to, or who has any rights in the premises. The charge is made that a few large bondholders have control of the matter and refuse to allow anything to be done until the small holders consent to join in their plans.

West Wisconsin.

A money mark t report telegraphed from Amsterdam to a German paper July 2 says:

"The Exchange was panicky yesterday by reason of a circumstance which happily seldom happens here. Yesterday the house which issued the 7 per cent. West Wisconsin bonds was asked why the payment of coupons was not announced, to which it answered that no instructions concerning it had been received. Then on all sides the report spread that the coupon would not be paid, whereupon the price fell 12 per cent. Meanwhile the issuing house and its brokers bought continually at the depressed prices, probably in order to keep up the price and prevent a further depression. Yesterday after the session of the Exchange orders were given on all sides to buy these bonds! Wherefore has become plain to-day. The issuing house announced suddenly the payment of the aforesaid bonds! Such a trick in trade is unheard of for a respectable house. The quotation rose to-day from 39 including coupon to 49 ex. coupon, closing at 47."

Pennsylvania Railroad Statistics.

The following summary is from the report of Auditor-General Harrison Allen, of Pennsylvania, and is prepared from the reports which the various companies are required by law to make to him, and which cover the year 1873:

Authorized capital	$515,368,954
Capital stock paid in	478,701,873
Funded debts	378,590,370
Floating debts	30,520,052
Cost of roads and equipments	621,312,048
Length of main lines, miles	3,401
Length of double track, miles	1,819
Length of sidings, miles	2,218
Length of branches, miles	1,557
Value of real estate owned	$25,821,7.7
Miles run by passenger trains	26,488,819
Miles run by freight trains	69,085,408
Miles run by coal trains	9,818,925
Through passengers carried	4,382,694
Passengers, all classes	39 541,800
Anthracite coal, tons	30,050,083
Bituminous coal, tons	12,764,292
Petroleum, tons	3,558 426
Pig iron, tons	1,523,418
Railroad iron, tons	556,117
Other iron, tons	1,091,247
Iron and other ores	4,372,439
Other freight	41,506,421
RECEIPTS.	
From passengers	$28,350,040
From freight	107,433,075
From mail and express	3 406,953
From use of cars	771,911
From miscellaneous	7,372,635
Total receipts	$147,995,214

The number of accidents to persons reported during the year was as follows:

	Killed.	Injured.
Passengers	27	166
Employes	254	665
Others	295	281
Total	576	1,112

Comparing this with the number of passengers carried, we find that one passenger was killed for every 1,464,511 carried, and one injured for every 238,204. The killed and injured set down under the head of "others" were mainly people struck at crossings or while walking on the track. The report does not include mine railroads, of which, it is estimated, there are about 1,000 miles, above and below ground.

Contributions.

English Versus American Bridges.

TO THE EDITOR OF THE RAILROAD GAZETTE:

My letter which appears in your journal of April 4 was followed on April 11 by a letter from Mr. W. W. Evans, on the superiority of the pin system, and in the same and two succeeding weeks by an article by Mr. Charles Bender on the comparative merits of English and American truss bridges. Although these two articles could—from the date at which they were written—obviously in no way refer to mine, their arguments are so entirely on the other side that you accept them as conclusively answering my case, and in your judicial summary, April 25, you give a verdict, on all points, against me.

Mr. Bender's article is an able one and shows a writer thoroughly acquainted with his subject, but as neither he nor Mr. Evans write with special reference to my case, some of the reasons which I gave for my views are of course not alluded to, and in your summary, also, what I should deem arguments to be answered are altogether ignored.

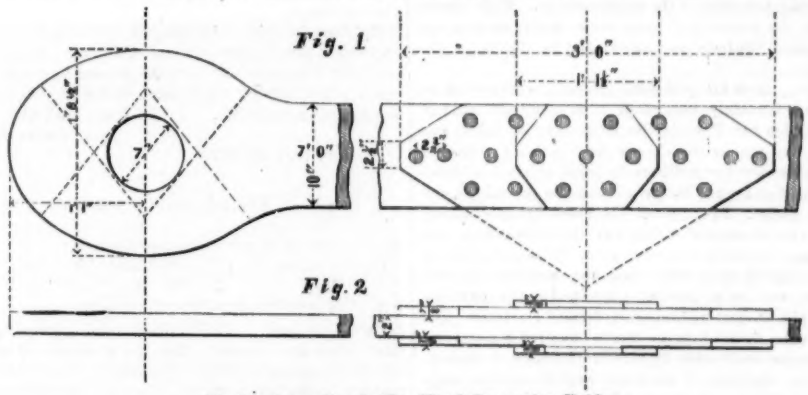
I do not propose to follow Mr. Bender in his elaborate statements, and must decline altogether the position, which your remarks seem to assign to me, of being the champion of the English systems. I leave to far abler men than myself the task of defending English systems in their details of construction from the attacks of American engineers; but as one who has been concerned rather in the building than the designing of bridges, I would wish with your permission to draw attention to some points in the controversy which I consider are untouched or unanswered by your own and the other articles which have succeeded my letter.

With regard to the comparative merits of the pin and the riveted systems, I drew a great distinction between the use of pin connections for small and large bridges, and I repeat that for spans over 120 feet the best English and American engineers would not differ very much in their designs. But the few and substantial connections of a large Warren or similar bridge by pins of say 4 in. to 6 in. diameter are very different from those in a Fink truss of small span where the numerous tie rods are fastened by small pins, and where even a bottom member to the girder is sometimes dispensed with altogether.

It is not the use of pin connections properly designed and used in suitable cases that English engineers condemn, but the apparent desire of American engineers to substitute pins for rivets in every possible case. A steam engine or machine whose parts are connected by pins and nuts can when necessary be stopped for repairs, the pieces taken asunder, examined and replaced; but a bridge is a permanent structure which does not need such treatment, and the connections should be such as to remain fast and effective under all circumstances. Riveted connections afford these conditions; small pin connections do not. Mr. Bender, speaking of American bridges, quotes as a specimen of first-class workmanship "the accurately turned pin fits into the accurately bored hole with a play less than 1-32 of an inch," and afterwards as the highest pitch of perfection which he can imagine "in order to remove the objections of English engineers it will be well to * * * * reduce the play in the pin-hole to less than 1-50 of an inch." If this be the utmost nicety obtained, such pins would hammer under railway traffic and certainly after a few years of service would not be equal to good riveted connections. Rivets as compared with pins have obviously no chance of being preferred in America if it be the case, as Mr. Bender says, that "In order to produce good riveted work a perfect plant must be purchased, such as is actually used by European firms of note. In the United States there is not an establishment which at present is prepared to build large riveted structures of reliability equal to the work furnished by first-class European firms." To judge by the remarks Mr. Evans makes about riveted work, the examples he has seen must have been of a very peculiar nature. He should know that rivet holes properly made do not require to be reamed out, and that in structures made by firms of repute rivets do completely fill the holes made for them in a manner unattainable by pins. Although I fully acknowledge the facilities obtained in erection by pin connections, both Mr. Evans and Mr. Bender appear to exaggerate the difficulty of riveting on the site. A good foreman and one or two leading hands will erect and rivet a bridge excellently with inexperienced workmen. As is well known to every bridge erector, it is not so much the skill of the riveter as the *quality of the workmanship in the factory* that determines the trouble and expense of connecting the pieces of a bridge, and if the pieces have been properly shaped and the holes made in the manner usual with first-class English firms, the work must go together properly or not at all. Mr. Bender speaks of the different modes of making links. Although sound heads can be made in various ways, very great care is necessary, and there is far more risk of failure from the defects of one piece (unless every link be tested than in the simpler riveted work which he so much contemns. More iron is consumed in the head of a link than in the riveted connection of a bar of corresponding strength, and more iron is consumed in the pin than in rivets. The advantage of single or double shear will be obtained in rivets where a pin will be exposed to a transverse strain only.

I must repeat what I said in my letter to your journal of April 4, which has not been answered, that the advantages of machine-made links are obviously more considerable in a new country like America, where many spans may be made alike from one design, than in England, where almost every span must be made to suit special circumstances, where carriage is cheap and where skilled labor is plentiful to erect riveted structures. Mr. Bender refers to Howard's system of rolling links. Messrs. Howard having discontinued business, there is now no place in England where this process is used. Although the head of a link may be formed by upsetting the end of a bar and shaping it by a steam hammer, or by first hammering a bloom into a short, thick preparatory shape of a link and then elongating it in a plate mill, generally the ends are shaped separately and welded on to the bar. This plan involves some risk, unless the precaution be taken of testing *every link*. Mr. Bender maintains so strongly the great inferiority of riveted connections that he may be surprised to hear that this method of connection may be deliberately chosen for economy in even such an extreme case (from the pin-system point of view) as the straight inclined chains of a suspension bridge. In the Albert Bridge, over the Thames, at London, erected in 1873, from the design of Mr. R. M. Ordish, who ranks as one of the first engineers in Europe, the straight chains required by his rigid suspension system are formed by simple bars connected as in the sketch, and with only the extreme end shaped with eyes for attachment by pins. But not only in these straight chains do the rivets form perfect and economical connections, but even in the catenary, had it been formed as a chain (it is really, for reasons not necessary to mention here, made as a wire rope), riveting would have been effective, though perhaps not preferable, however loudly some engineers may magnify the lateral strain or leverage on the rivets, a strain which in a flat curve is in fact too small to be appreciable. It is true that shaped and drilled heads and eyes for all the connections of the links might have been as cheap and effective for the Albert Bridge as rivets, if there had been in England, as there appears to be in America, machinery regularly established for the production of links; but there was not, because at present the demand for links of a fixed or constantly recurring shape is, for the reasons here explained, so limited, and therefore only the extreme end connections of the chains were made with shaped ends and pins. Were there, however, such a demand, that is to say, did the incidents and conditions of bridge erection require them, machinery for this purpose would be established as promptly as it always is in this country for purposes of utility. But on the other hand there are the English methods of making perfect-fitting rivet holes, methods which Mr. Bender acknowledges are not obtainable in American workshops. In England, also, skilled labor and supervision are readily and cheaply obtained for erecting and riveting bridges.

Both Mr. Bender and Mr. Evans maintain that for permanent structures the nuts or pins are as little or even less liable to become loose than rivets, and that rivet heads may and do fly off, while nuts may be effectually fastened. I never heard of rivet heads flying off, and for structures such as bridges, which are not always regularly examined and put in order, I can only repeat that rivets may be more safely left to themselves than pins and nuts. Those rivets which are put in by a riveting machine in the factory, fill the hole so tightly and completely as to require drilling out if it is necessary to remove them. Finally, with regard to this part of the controversy, the assertion that pin bridges may be made 20 per cent. lighter and cheaper than riveted bridges will be entirely denied by English engineers, of course with the proviso that the material in each case is of similar quality and the girders of similar depth.



Riveted Connection in the Albert Suspension Bridge.

Although I am, in the present instance, fighting the battle of rivets against pins, I beg distinctly to acknowledge the advantages of pins in certain cases—namely, in those where the pins are large, where the erection of a bridge is difficult, and where because of the scarcity of skilled labor riveted work may escape control and inspection. In England, on the other hand, and in many parts of India and the Colonies, the above conditions do not obtain, and in such cases the advantages, as time will show, lie strongly in favor of rivets.

With regard to the depth of girders, Mr. Bender quotes against us the rules established by Fairbairn and Hodgekinson, which he declares to be wrong. In that these rules are inconclusive and based upon insufficient data, the leading engineers in England will agree, but it must be remembered at how early a stage in the construction of iron girders Fairbairn's experiments were made, and how vast the additions since to the forms of iron obtainable, to the combinations of those forms in construction and to the actual evidence of experience. I will go so far as to acknowledge that Fairbairn's rules, as quoted often in text books, have had an undue influence among students in determining the proportion of depth to span in girders. But English engineers of eminence, to whose skill all important works are entrusted, are quite aware of this, and do not consider that a depth of 1 in 12 has some marvelous properties for which it should be blindly adhered to. But, on the other hand, they do not rush to the opposite extreme and determine that deep girders of 1 in 7 or 1 in 8 are always the best. They judge each case on its merits, and generally have good reasons for what they do. In your judicial summary of April 25 you say: "When we come to examine the trusses which support the floor, we should say that it is not desirable to attempt to give excessive depth of truss to spans of 120 feet and under for the sake of saving iron." This removes from the controversy a considerable proportion of the bridges in either country. For instance, most of the bridges made in England for India come under this category, the roadway being for many reasons placed on the top of the girders. Of this you are apparently aware, for you go on to say: "American engineers have had to deal with the reverse of these conditions." But even where the roadway is below the girders there are often many reasons which forbid the use of deep girders."

In railroad bridges of small span, say under 100 feet, the web would—if any advantage is to be obtained from the depth

of the truss—be lighter than, for secondary reasons, would be proper. The flanges also would be lighter, and English engineers prefer, even at some sacrifice of material, substantial members to the girders exposed to railroad service. For small spans also even a deep truss will not allow sufficient headway for overhead bracing. In longer spans, where the girders would be deep enough for such bracing, it must be remembered that if its use saves in vertical stiffeners, increased strains are thereby transmitted through the flanges to the end frames. But other reasons will be found generally to prevail with English engineers against the use of deep girders. One of these is that the platform of the bridge is so wide as to render overhead bracing almost impossible, unless a third main girder is used between the two outer ones. Charing Cross Bridge over the Thames at London is a case in point, and one which at first sight would appear to offer a favorable opportunity for deep trusses. The bridge is 970 feet long, five of the spans being 154 feet each, and the girders are 14 feet deep. The bridge forms the approach to an important terminal station and is made wide enough for four lines of rails. As constant shunting is going on from one set of rails to the others, an intermediate or third girder would prove an obstruction, and is therefore not introduced. Even if the girders were deep enough for overhead bracing, which they are not, such bracing across so wide a bridge would be difficult and expensive. The other reason is perhaps too æsthetic to have much weight in so utilitarian a country as America, but it has here. It is that deep girders form a deep sky line, obstruct the view, and are called ugly. Already there is in England a great outcry and much real or assumed indignation against the structures contrived by engineers. Girders deeper than absolutely necessary would not be allowed in an English city.

Mr. Bender, in comparing the American and European methods of forming compression members, speaks slightingly of riveted members. Perhaps he is not aware how carefully such can be designed to give trough or nearly tubular sections, and the extreme accuracy of the workmanship. With planed butt joints in the plates and exact rivet holes, such as are made in England, the immense superiority he claims for pins does not exist.

Mr. Bender is, from his position, probably committed to, and his name is certainly associated with a certain kind of structure of which the Phœnixville truss may be taken as a sample. He has apparently—I say this with all respect—neither the desire nor the facilities for making riveted structures, and therefore argues like an advocate or special pleader rather than a judge. In England the chief bridge-builders make either pin or riveted bridges as their customers, the engineers, may demand. Personally, so far as pleasure or profit in the manufacture comes into the question, I prefer the pin system, and am at present concerned in the manufacture of some pin bridges with properly formed eye-links. But every case is here decided on its merits, and pin trusses and riveted trusses are built side by side in the same workshop. If an American engineer of eminence were to establish himself in England with the desire and intention of introducing the system he now prefers, the very abilities which would have already enabled him to distinguish himself in his own country would lead him to modify his views under the new conditions presented. With English iron, with skilled English workmen and appliances at his command, he would find, as case after case came before him for consideration, that the deep pin trusses were not always the best suited for his purpose, and he would have to acknowledge that the best English engineers in making their designs did so, not in ignorance of the advantages which he claims for deep pin trusses, but because when all the circumstances and conditions were fairly weighed, the English system of riveted structure was very often the best.

The following may be taken as a summary of the English view of the case:

1. Pin connections are not suited for any but trusses of a size to require large pins. This applies only or chiefly to *railroad* bridges, as small pin trusses for road traffic may be more safely used.

2. The demand or necessity for large spans does not occur so often in England as in America, and therefore there are fewer opportunities for the judicious use of pin trusses.

3. Wherever the locality of the bridge allows of easy transport and erection, riveted connections are preferred by most English engineers as more permanent and satisfactory than pin connections, this always assuming the most accurate fitting of the parts and coincidence of the rivet-holes, conditions which are obtainable in bridges of English manufacture.

4. The comparatively few opportunities in England for making spans long enough to allow the advantageous application of overhead bracing render deep girders very uncommon, and, in the few cases where it could be applied, the secondary reasons before alluded to prevail and a depth of 1 in 9 is hardly ever obtained.

With regard to deterioration by rust, I am so entirely at issue with Mr. Evans that it is hopeless to argue the point. Plates and bars lapping over each other do not, if properly riveted, allow moisture to enter in, as he contends, although in structures designed by incompetent men a reckless piling together of plates and the unskillful use of numerous packing pieces do involve such risks. But even in American pin bridges I apprehend that in the upper members or flanges there is the same use of riveted work as in England. I deny that there is yet such experience of durability as to allow a fair comparison between pin and riveted connections. Both in respect to the hammering of pins and deterioration by rust 20 more years must elapse before a comparison can be fairly made. Links lapping over the top flange of a girder or over each other with a clearance, as is often the case, of from ¼ in. to ½ in., are neither close enough to keep out moisture nor far enough apart to permit easily of effective painting.

Before concluding this letter I must refer to your editorial remarks as to my statement about the accidents caused by the failure of American bridges. You say "there is as yet no instance of an iron bridge designed by any of our leading engineers or engineering firms which has ever given way. Can Mr. Matheson say the same for English bridges?" I cannot only answer this challenge in the affirmative, but I need not confine myself to the work of "leading engineers." *None* of our iron bridges give way, and in my letter printed in your journal of April 4, I was unnecessarily within the mark in stating that not one bridge per annum failed. I may as easily say not one in five years, for since the first construction of railways in this country there are not three such accidents recorded that I know of. But even confining yourself, as I do not, to bridges built by "reputable firms," you give six exceptions to your rule which go far to corroborate my first assertion. Nos. 1 and 5 are bridges in which the wooden beams decayed and gave way. We also have bridges with wooden floors which are not allowed to fail. In each of the cases Nos. 2, 3 and 4 the bridge did not give way but was "knocked down" by a train off the track. I specially drew attention in my letter to the fact that English bridges were made strong enough to resist a train which was off the track. No. 6 was a case where a bridge was designed for a light load and failed when subjected to a heavy load. Surely some engineer was responsible for this. In fact, cases Nos. 1, 5 and 6 suggest that the permanent engineers of a railroad rather than the manufacturers—as in America—should be the men responsible for the designs, and so be acquainted with the strength of their bridges and all that is required to maintain them.

Assuming that in England we are prejudiced unduly against pin bridges, at any rate to those we have, and they are many, we give a fair chance by examining the pins occasionally and preventing rust. But how shall we calculate the risks in America, where a Fink truss with innumerable rods, pins and nuts may be used on railroads where the permanent engineer allows wooden beams to become rotten and loads never anticipated or provided for to pass over his bridges? Our absurd English caution appears to be more needed in America than at home.

My share in this controversy is now ended, and I can only hope that your readers may after all give English engineers credit for not being so very far behind the age. I have to thank you for giving up so much space in your journal to my letters, and remain, Sir, Yours faithfully,

EWING MATHESON.

LONDON, June 30, 1874.

Remarkable Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I would like to add to your account of large engines on the Lehigh Valley road that there is also with the "Janus," the "Bee" and the "Ant" now running on the mountain grade at Wilkesbarre, built by Norris Brothers at Lancaster, Pa., which have 20x26 in. cylinders and ten 4 ft. 6 in. driving-wheels, weight 65 tons each without the tender; also one of the mogul pattern, doing good service on a mountain grade that rises 1,200 feet in 13⅓ miles through a winding course.

I believe the smallest locomotive in the world is the one to be seen in the South Side Railroad shops at Petersburg, Va. This engine is of the Mason pattern in every particular and of the ordinary American plan—four wheels coupled and a pair of forward trucks. The driving-wheels are 8 in. in diameter, cylinders are 2 in. by 3½; I do not know the capacity of the boiler, but should judge it to be about 2½ gallons to the third gauge cock. The entire engine and tender is less than four feet long; the gauge is only 9 inches, and she will weigh when in full working order less than 250 pounds. She is a complete engine in every particular and has all the attachments of the ordinary Mason locomotive engine. Her diminutiveness may be judged from the fact that an ordinary sized man cannot reach the reverse lever through the windows, it is so small; and this machine has actually run a train of coaches at a fair held in Petersburg four years ago. She was propelled by steam produced by fire in the fire-box. This engine was built under the direction of Captain James Robinette, Master Mechanic, and by the order of General William Mahone, President of the Atlantic, Mississippi & Ohio Railroad Company. If there is a smaller locomotive in the world than this it would astonish me more than this did when I saw it, and I would like to learn of it through the columns of the GAZETTE.

GEORGE A. HAGGARTY.

Are English Cars Smoother in Motion than American?

TO THE EDITOR OF THE RAILROAD GAZETTE:

If the substance of a paper read at the recent meeting of the American Society of Civil Engineers be a fair theme of discussion before it has appeared in print,* I wish to ask if it be really true that the English railways run on the average, or even occasionally, carriages which are incomparably smoother in their motion, and thus easier to ride in, than are our standard eight or twelve wheel cars?

If I understand the paper in question, it set forth that the rails used upon English lines are more perfectly adapted to the duty required of them than ours are, and hence the rail surface upon which the cars travel may be and is kept in more perfect condition than it can be on our lines, and hence the carriages run more smoothly than ours do.

I endeavored to set forth in your columns some three years ago my own views upon this point, which were to this effect: that the absence of the truck with its provision for side swaying of the body of the car permits an uneven side-knocking to be imparted to the car as the wheel flanges strike the rail first on one side and then on the other, and also that the practice, almost if not quite universal, of attaching the long side springs to the body of the carriage by links and tension screws that pull upon the spring lengthwise causes a vibration of a nature wholly different from that arising from or due to the elasticity of the spring, and I do not see any way in which this motion or jarring can be obviated or removed except by entirely changing the way of placing and attaching the spring.

I also described this motion as being almost identical with that experienced in our lighter passenger cars when running at good speed with the brakes set hard, as when approaching a station, and this impression I have found agrees with the experience of several others with whom I have spoken of it.

We shall soon know whether our American plan of trucks under long cars will not give a remarkably greater ease and smoothness of motion to the trains on English lines than they now commonly have, for I believe it is understood that the Pullman cars just starting on the Midland Railway are in all these respects built entirely upon our American plan.

I have an impression that we shall hear of at least the thought of seasickness on the part of some of the English travelling public, in their first use of the Pullman cars, in consequence of the swaying motion which in some small degree at least is sure to be experienced even upon the costly and very perfect track of the Midland Company.

I do not see how it can be claimed that average English carriages, or even the best of them, run or can run as smoothly even on their perfect tracks as our average car of recent construction will run on our good average track, and I believe that our best cars, when placed on the best English track, will show an ease and quietness of motion incomparably greater than has been experienced hitherto on such track in the best four or six wheel English carriages. A JUNIOR MEMBER.

*This letter was received before the publication of the paper referred to.—EDITOR RAILROAD GAZETTE.

Some Limitations of Mechanical Improvements.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The instructive paper read by Captain Tyler before the Society of Arts, and given in the last number of your paper, opens, among other important questions, that of how far automatic signals and similar appliances are, and may be trusted to be, really and entirely automatic. Without undertaking to enter into the details of construction by which the most approved signals are rendered interdependent, and so automatic in producing the result sought to be accomplished by the signalman perhaps many yards away, it is well to point out the dangers, or some of them, that may not be fully appreciated by those seeking, in increasing numbers and with growing perseverance, to urge their devices upon the attention of railroad managers.

The contrivances and appliances for signaling are not the only parts of the machinery of railroads that are thus in danger of being improved, as many inventors claim they may be; but many of the simpler, and even rudest parts, as they may seem, are attacked by way of improvement, which, because of their simplicity, are nearly perfect, although they may be rude and primitive by the side of the elaborate and perfect device of some one of those inventive men whose name is legion, but whose art is barren of any really useful result.

The common car-axle box may be named as one of the parts, liable to give occasional trouble by heating, and by breaking or by wearing out, but how could anything be simpler, consisting of fewer parts, and hence, because of this simplicity, almost impossible to be got out of order? Yet what railroad man has not been beset by those who have contrived and perfected, if their own story were to be believed, just the very box that will run with less oil than any ever heard of before, which cannot heat, cannot lose off the door or cover, and which, in fact, only needs to be put on to a thousand cars to demonstrate to the world the entire futility of any attempt to think of getting along with anything except just that very box?

Probably few men appreciate the need of the most perfect contrivances, for even the minor parts of their plant and machinery, more fully than these very railroad men who seem so slow to adopt the multitude of plans, or any of them, urged thus upon their attention, since they only know the need of using the very best contrivance for any given purpose, and the risks or dangers that are daily run, even with that which experience may have shown is really to be trusted, although subject to some uncertainty. They know, too, at a glance, or the really experienced among them do, where the weak points lie of a new device, presented to them for adoption or examination, better than any one who has not passed through the same school as themselves, and hence arises the fact, so often noted, that a railroad man may have urgently brought to him for use some device embodying exactly what his experience had suggested to him years before as a possible way out of some difficulty, but which upon trial proved in fact to be a way into more difficulties than had before existed, and some that had not been thought of at all.

A great variety of examples can be named of a kind exactly similar to those mentioned, but these two points need only to be urged at this moment, namely, the chance of failure in the contrivance from inherent defects of manufacture or of the material of construction, and also the chance of failure in the use of the contrivance itself. So long as the fallible men must be employed to make and use all the details of railroad machinery, upon whom, too, Captain Tyler must rely for the perfect working even of the splendid interlocking signals of the great English railway stations, so long constant watchfulness must be the price of safety, and this watchfulness must be maintained not only in the signal box at the moment of forwarding a passing or a halting train, not only on the locomotive where danger never sleeps, but even more (and certainly first) in the making and constant inspection and care of those qualities and adjustments which alone make and maintain the automatic or perfect working of any fixture or part, upon which as a key or sensitive spot the whole welfare may depend.

P. BARNES.

Edgar Thomson Steel Works, Pittsburgh, July 13, 1874.